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NATIONAL MATERIALS AND MINERALS POLICY

ORIGINAL

HEARING

BEFORE THE

SUBCOMMITTEE ON SCIENCE, TECHNOLOGY, AND SPACE

OF THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION UNITED STATES SENATE

NINETY-SEVENTH CONGRESS

SECOND SESSION

ON

OVERSIGHT OF NATIONAL MATERIALS AND MINERAL POLICY

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NATIONAL MATERIALS AND MINERALS POLICY

WEDNESDAY, JUNE 23, 1982

U. S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
SUBCOMMITTEE ON SCIENCE, TECHNOLOGY, AND SPACE,
Washington, D.C.

The subcommittee met, pursuant to notice, at 1:50 p.m. in room 235, Russell Senate Office Building, Hon. Harrison H. Schmitt (chairman of the subcommittee) presiding.

Staff members assigned to this hearing: Louis H. Blair, professional staff member; and Steven H. Flajser, minority professional staff member.

OPENING STATEMENT BY SENATOR SCHMITT

Senator SCHMITT. The hearing will come to order.

The chairman apologizes for letting budget considerations take 15 minutes from the hearing.

Who knows, we may have a budget resolution yet.

This afternoon the Science, Technology, and Space Subcommittee of the Committee on Commerce, Science, and Transportation is having its oversight hearing on the National Materials and Minerals Policy. Research, and Development Act of 1980, which is Public Law 96-479.

This act calls for Federal policies and actions to assure that the United States has materials and minerals we need for national security and for our economic well-being which is certainly a fundamental part of our national security.

We will review the progress of the administration in complying with requirements of this act which originated both in this committee and in the Committee on Energy and Natural Resources.

We also want to find out what else needs to be done to reduce the vulnerability of the United States to disruptions in supplies of a wide variety of essential materials such as cobalt, chronium, manganese, tantallum, and natural rubber, just to name a few.

This vulnerability, which is of great concern to me and to many others of my colleagues in the Congress and others throughout the country, is one of the most important and still least recognized and addressed threats facing this Nation.

Our national security and economic well-being are critically important and critically dependent on the availability of a wide variety of materials and minerals. Our Nation's technological achievements, industrial strength, and military might in this century have been due in large part to our Nation's unique ability to develop innovative, often spectacular uses of a wide variety of materials.

Yet today our assured access to some of these critical materials is uncertain. Our domestic metals mining industries are suffering severe losses that they cannot long sustain and many are closing. In the past 5 years 61 major mines, both underground and open pit, have been closed for economic reasons. Fourteen of these were in my home State of New Mexico.

U.S. trade agreements have caused our mining industry to face what I consider to be unfair competition from abroad in spite of all of our great protestations about free trade. Free trade cannot be a one-way street. We have come to rely on potentially unreliable foreign sources for most of our chromium, cobalt, magnese and for other essential materials.

The national defense stockpile, our Nation's inventory of critical materials for defense purposes is short of many of its goals. It has been managed inefficiently for many, many years and is very expensive to maintain in its current state.

Domestic processing capabilities for some critical raw materials are disappearing. Many of the exports of copper concentrate now are almost total for certain industries going, principally to Japan and being returned as refined copper.

Reports that we have received indicate that existing stockpiles of ferrochromium and tantalum could require several years to process domestically and our capability for processing titanium and quartz are extremely limited.

Research and development holds a promise to reduce stockpile requirements substantially for some materials. New domestic mining opportunities holds out the prospect of further reduction in stockpile requirements. Yet, a congressional research survey for me could identify only about $8 million specifically targeted to reduce demand for stockpiled materials.

The President recently submitted the National Materials and Minerals Program Plan and Report to Congress as called for by Public Law 96-479. This is the first report from a President in nearly 30 years on this critical subject. This is a necessary and significant step toward reducing the Nation's material vulnerabilities. The program plan identifies a number of important actions to be taken.

Today's hearing will focus on the President's plan on actions to implement recommendations in the plan, on progress to meet other provisions of Public Law 96-479, and on other efforts to reduce our vulnerabilities in this critical area.

We will open the panel with four non-Federal experts. That implies that the Feds will be experts, and I hope they are.

In order of presentation, Adm. William Mott, Executive Director, Council on Economic and National Security; Simon Strauss, representing the American Mining Congress; William Manly, senior vice president of Cabot Corp.; and Maxie Anderson, my friend and associate from New Mexico who is chairman of Ranchers Exploration & Development Co.

It is great to have you all here and it is great to have Maxie down from his balloon long enough to help us out on this subject, too.

The first witness is Adm. William Mott, and before you go, Bill, I would like to insert into the record at this point statements by Senator John Danforth, of Missouri, and Howard Cannon, of Nevada.

[The statements follow:]

OPENING STATEMENT BY SENATOR DANFORTH

Mr. Chairman, I want to commend you for scheduling this hearing on the administration's strategic materials and minerals policy. I am particularly interested in the possible use of title III of the Defense Production Act to expand domestic production of essential materials.

To cite but one example, the United States is almost totally dependent on unstable regimes in Zaire and Zambia for its supply of cobalt. The largest single use of cobalt in this country is for super alloys, mostly for jet engine parts. Cobalt is critical for such aircraft as the F-15, F-16, and F-18, and for missiles and the M-1 tank.

Mining companies are ready and willing to expand their domestic production of cobalt to a level that would meet this country's strategic needs, but the risk of predatory pricing by foreign competitors currently makes such a step imprudent without a guaranteed market. A long-term purchase commitment by the Government under title III would provide the assurances these companies need to proceed with cobalt production and would assure the nation of an adequate supply in time of crisis. Such a step could prove to be a prudent and foresighted one, in the interest of our national security, and I look forware to hearing today's witnesses comment on this subject.

OPENING STATEMENT BY SENATOR CANNON

Mr. Chairman, I want to thank you for calling this hearing to review the President's plan to implement the National Minerals and Materials Policy Act. I regret that I am unable to be in town today to participate. You are to be complimented for the leadership you have exhibited in this important area through several Congresses.

When we worked together in the last Congress to push through this legislation, we hoped that this law would stimulate the administration to take certain actions to make the U.S. less dependent on critical minerals and materials. Disappointed as many of us are that this 33-page report does not say more—and I will indicate some areas where the report falls short—it is only fair and proper to note that this report represents the first effort by any administration in many years to try to deal comprehensively with materials availability issues.

The general concern I have with the plan is that it is so short on specific measures. The report sets the proper context and identifies some vital areas for consideration, but how are we to know the nature of the follow-up actions and who's in charge? Mr. Chairman, in the letter we recently sent the President, we asked where is the administration's implementation strategy? I hope Secretary Watt and other administration witnesses can address this today.

There are several other concerns I have.

First, I continue to be concerned about the U.S. industrial base for both national security and economic purposes. It is one thing to be dependent on certain materials and minerals we have no other choice but to import. It is yet another to be dependent on available industrial capacity to convert these raw materials into products used for defense and other purposes. With regard to the U.S. industrial base, we should have the capacity to do something about it. But are we? Many have expressed concerns about our inadequate capacity. Most recently the Institute for Defense Analysis raised this concern in a report completed for the Defense Department.

The entire subject of our industrial capacity and the impact of materials availability on our economy should be a major emphasis of our national strategy. That's why I believe the Commerce Department role is so important. Their study on the aerospace industry was excellent, but again I am interested in the follow-up actions that will be taken. Also, I would hope that the Commerce Department some day soon will explore the capability of our minerals and materials processing industries.

Second, why is there such little emphasis on the role of science and technology in helping to meet our material and minerals needs? I am convinced that one of our long-term strategies must rely on scientific and technological advances. This has been a major emphasis of the Commerce Committee. At our request the Office of Technology Assessment will conduct a major study of technologies to reduce our materials vulnerability.

Finally, why is it that the plan totally ignores the potential of conservation and recycling as a strategy for decreasing our minerals vulnerability?

There are other areas that I would have hoped would be considered. The important thing, however, is that the President's report represents an important beginning. For example, I applaud efforts to restructure the stockpile for national security purposes as long as purchases and sales are done for that reason only. I would be interested in knowing what specific steps the Administration will take to assess the quality of the existing stockpile.

It is now incumbent on the Administration and the Congress to see to it that additional pieces fit into place and that we will have a coordinated national policy and set of programs.

I look forward to reviewing the hearing record.

Thank you.

STATEMENTS OF WILLIAM C. MOTT, EXECUTIVE DIRECTOR, COUNCIL ON ECONOMICS AND NATIONAL SECURITY; SIMON D. STRAUSS, AMERICAN MINING CONGRESS; WILLIAM MANLY, SENIOR VICE PRESIDENT, CABOT CORP.; AND MAXIE ANDERSON, CHAIRMAN, RANCHERS EXPLORATION AND DEVELOPMENT CO.

Admiral MOTT. Mr. Chairman, first of all, let me echo your approbation of the President's report. As you said, it is the first such report since President Eisenhower submitted one and I think it is a very good start.

I represent, as you mentioned, the Council on Economics and National Security which has no special interest and has no axe to grind except the public axe.

I have distributed copies of the book which we recently published on this subject, "Strategic Minerals: A Resource Crisis," for the members of the committee; it contains a very fine presentation by one Senator Jack Schmitt.

So I start off by applauding the President's report to the Congress, and I would hope, sir, that the people in this administration would realize that in order to bring the objectives of this report to fruition they will have to enter into a partnership with the Congress—something that has not always been the case.

Simon Strauss and I testified before the House Armed Services Committee on the sale of silver. Incidently, I might say that Simon Strauss is like the Oracle of Delphi when it comes to the problem of mismanagement of the stockpile. He knows its history all the way back to the days of World War II since he was present at the creation, so to speak. At that time we both testified against the precipitous sale of silver. While we thought it was a bad idea, it was, sadly enough, in accord with the normal procedure for the sale of materials from the stockpile. That normal procedure, unfortunately, has developed over the years to be tantamount to selling low and buying high. That has happened so many times in the history of the management of the stockpile that is has now become axiomatic.

I think one of the problems, Mr. Chairman, has been that the stockpile is supposedly managed by the General Services Administration, but there is an old Biblical expression which helps us identify the man who is actually the choreographer of the management of the stockpile, for that Biblical expression states: "the voice is the voice of Jacob, but the hand is the hand of Esau."

In this case Esau is the Director of the Office of Management and Budget. It doesn't make any difference whether the name is Stockman or McIntyre or any of their predecessors. He is the one that decides what is going to be sold from, and usually how much can be bought for, the stockpile.

The sale of silver, I understand, was blocked by your colleague, Senator McClure, when it came over to this body. Accoding to information I received this morning—and I hope it is true—the administration is going to call off the silver sale because it came in so low and, also, because it did not please the members of this body.

That is why I come back again to the term "partnership." I would hope that before taking any action of this kind members of the administration would get in touch with the people in Congress who are going to pass on any such action, that is, before and not after the fact.

One way to bring the stockpile under proper management is, as I said, to divorce political appointees and bureaucrats from it, and particularly the Director of the Office of Management and Budget, by putting it under an independent body. That is why in my prepared statement I have endorsed the principles of Senator Schmitt's bill (S. 1982).

As you know, sir, the principles of the Schmitt bill were present in the report which the Task Force on Strategic Minerals sent to President-elect Reagan way before his inauguration. The members of that Task Force—and there were three members of our council in addition to myself on the task force—felt that the stock pile absolutely had to be independently managed.

Now that doesn't mean that I feel the President should not be able to step in during times of national emergency, but if it is left in the hands of the administration you can be sure that the choreographer will get in the act and use the stockpile to try to balance the budget—and that approach rarely works in the national interest.

I have read Dr. Bement's statement and I realize that he will not be able to be here to testify in person, but I would hope that the Senators on this committee would read his written statement because, while he takes a whack at the current management of the stockpile, he makes some very good points about how the President's program plan should be implemented. While the plan is broad in scope, it is not at all clear on just how—and by whom—it is to be implemented.

I get the shivers when I read something like the following in this report to Congress, and I mean shivers of apprehension. It states: "The administration will expeditiously dispose of those stockpile materials held in excess of goals and acquire additional materials through the appropriations process."

Well, we have just acquired some materials for the stockpile. We bought $78 million worth of cobalt from Zaire, and I hate to tell you how that cobalt got from Shaba Province into GSA warehouses in Baltimore. It went by train, pulled by South African locomotives, from Shaba down through Zambia, over the Victoria Falls Bridge, and through Zimbabwe into South Africa to the port of Durban where, I suspect, it was loaded in foreign bottons to go 7,500 miles to Baltimore. But in times of emergency, we simply

cannot protect that route and I don't think any of us would want to commute to work every day over that route either.

So the question remains, who is weighing off whether or not it is better to import cobalt from Zaire than to invoke title III of the Defense Production Act to help domestic cobalt mining in Idaho? I spoke with a mining industry representative this morning who said that no cobalt is going to be mined in Idaho. In fact, no cobalt is going to be mined anywhere in the United States as long as the competition, in a country like Zaire, has government-controlled and subsidized mining organizations.

Just two further points.

First, while the Law of the Sea is mentioned in the President's report, we have now come to the point where we have to make a decision on this treaty. Not a single one of the President's six negotiating objectives on the mining provisions of that treaty were met in New York. Therefore, we have to fish or cut bait now with regard to the Law of the Sea Treaty. The United States must decide, first, whether it is going to be rejected or accepted and, then, whether we are going to seek repricocal states agreements or try to reach some other type of accord. But the quicker we act on these unresolved questions, the quicker we can confer with our allies on the treaty matters.

Second, I was also disappointed, sir, that the word "education" was missing from the President's report. I know that is a subject which is close to your heart. You have warned that there is going to be a great shortfall of geologists and engineers. I talked with members of a technological panel affiliated with Georgetown University's Center for Strategic and International Studies this morning and they confirm exactly what you said in your comments that are found in this book of ours "Strategic Minerals: A Resource Crisis," based on the conference we held in New York. Yet, this body had to save the appropriations for the 31 land-grant colleges this year and there is nothing in the appropriations bill for 1983 for those institutions. So you may have to come to their aid again in the future.

In conclusion I would like to say that what this committee needs to do is to ask the administration, in the words of the old baseball phrase, "Who's on first?" Who is responsible for implementing the principal functional subheadings in the President's report? Hard questions have to be asked like "Who's on first?" with respect to the implementation and execution of each of the functional areas outlined by the President in his program plan and report to Congress.

Cabinet Councils are fine for broad formulation of policy, but they remind me, Mr. Chairman, of the story by H. G. Wells that appears in a book called "Walpole Island." He describes a brobdingnagian prehistoric monster who starts its tail around to try to brush a fly off its nose. When the tail gets around half way, first, the monster has forgotten what it started out to do and, second, the fly has flown away.

You must have responsive subgroupings of people from the various agencies who will execute this program plan outlined in the President's report or it isn't going to go anywhere.

I will now turn the floor over to my colleague Simon Strauss.

[The statement follows:]

STATEMENT OF WILLIAM C. MOTT, REAR ADMIRAL, USN (RET.), EXECUTIVE DIRECTOR, COUNCIL ON ECONOMICS AND NATIONAL SECURITY (CENS)

Mr. Chairman and members of the committee, my name is William C. Mott, and I am the Executive Director of the Council on Economics and National Security. A statement of the council's purpose is attached.

I should like to make it clear that the Council, with its broadly based membership, has no axe to grind except the public axe and represents no special interests. Thus, we bend our major efforts by means of publications and conferences, first, to ascertain the facts with respect to strategic minerals and, second, to make suggestions for action based on those facts. One of our latest publications is provided with this statement. It examines many of the minerals issues now before this Committee and features a keynote address by Sen. Schmitt.

The Chairman has asked for my comments on President Reagan's National Materials and Mineral Program Plan of April 5, 1982. I am pleased to comply and wish to note at the very outset that the President's policy statement represents an important and necessary—and I might even say—unprecedented first step in the formulation and implementation of a national minerals policy.

In 1980 the first step the President-elect took in the policy formulation process was to assemble a broadly based Minerals Task Force to advise him "concerning the availability of resources vital to our industrial capacity" and to make recommendations in the premises. Some twenty-four prominent members of the mining industry, the user industry, the academic community and the military comprised the Task Force. I and three other members of our Council were privileged to serve as members.

Many of the some thirty-three recommendations of the Strategic Minerals Task Force found their way, in one form or another, into the President's National Materials and Minerals Program Plan. For instance, the Task Force recommended as a short-term step that stockpile inventories should be brought up to established goals as quickly as possible. Pres. Reagan, as his report to the Congress indicates, has made the first stockpile addition in twenty years and has announced augmentation plans on a regular and sustained basis.

No one can quarrel with the general policy announced by the President that the stockpile should be sufficient to meet military, industrial and essential civilian needs in support of the national defense in a crisis. One can question how that laudable objective is to be achieved, absent concrete plans for efficient stockpile evaluation and management.

Almost every group which has looked at our stockpile history has concluded, as did our Task Force, that it has been subject to neglect and often used through sales as a budget-balancing instrument. In short, as a political instrument. Colleague Simon Strauss, who was present at the creation and is here with me today, can tell you all about that, in chapter and verse.

The President's Program announces that we will direct a panel of experts to review the quality of materials in the stockpile and recommend such actions as may be necessary to ensure the quality of the stockpile.

It seems to me to be a legitimate oversight function to ask who will be on the panel and when will it begin. Everyone recognizes the necessity, and most everyone who's looked at the problem feels that the panel should be comprised of carefully selected government and industry experts who would evaluate both the quality and quantity of current materials and establish priorities for eliminating, changing, upgrading and/or replacing inventories.

Somehow, long-range, a system should be developed to depoliticize stockpile management. Serious consideration should be given to an independent body—independent of bureaucrats, that is—such as S. 1982, Sen. Schmitt's bill. I certainly endorse its principles.

The President's Program seeks to reduce our future dependence on potentially unstable sources of minerals by eliminating barriers to the development of the mineral resources of the deep seabed. He hoped to accomplish this by negotiating major revisions to the current draft of the Law of the Sea Treaty. Indeed, he set forth six changes necessary as conditions precedent to his support of ratification. (For these changes see Appendix A.)

It is my understanding that none of those six changes was accomplished and that we stand virtually where we were before the recent treaty sessions at the United Nations. The question is, where do we go from here? And that question, while the treaty draft is still in the hands of the Executive, can only be answered by him. The

point is time is of the essence, particularly where our allies and the other industrial states are concerned. They will want to know where we stand on the treaty draft—and soon. And they'll want to know if we have a viable alternative to the treaty for deep seabed mining.

A member of our Council on Economics and National Security, retired Air Force General Alton D. Slay, after decrying, in a speech given to a Defense Strategy Forum, our dependence on shaky foreign sources for critical materials added:

"We could reduce our dependence on the stockpile and foreign sources for many of these critical materials. But our mining industry is the sickest part, the absolute sickest part of our total industry of these United States. It has been sliding downhill precipitously for a decade, thanks to, in great measure, eighty separate federal laws, enforced by twenty separate federal agencies that, to one degree or another, restrict or regulate the minerals industry."

It seems to me that the President's stated program to open up federal land to mineral exploration and possible development, to seek to eliminate excessively burdensome or unnecessary regulations and statutes which adversely affect the domestic minerals industry is a good program. But, speaking as one who has been in the public-interest law business as the President of a litigating foundation, the road to accomplishment of his aims will be long and hard.

The American mining industry needs immediate help, and I believe that help should come through Title III of the Defense Production Act. The President's Program states that there is an ongoing analysis of the Act to determine whether circumstances exist under which the use of the Defense Production Act incentives would be more cost-effective than stockpile purchases.

I would hope that this committee would ask for reports on that analysis, remembering that where national defense is concerned cost-effectiveness should not always be the deciding factor. Survival of an industry and an assured domestic source of supply should also be important considerations and, indeed, have been ever since the famous Sen. Malone report of 1954.

Having mentioned Sen. Malone, who came from Nevada, the same great state as Sen. Cannon, let me repeat some of the key findings from the report, now nearly thirty years old, of the Senate Committee on Interior and Insular Affairs. It is labeled—and the label is significant: "Accessibility of Strategic and Critical Materials to the United States in Time of War and For Our Expanding Economy."

Found the Malone Committee: It is vital to our domestic welfare economy and security that maximum economic production be maintained, first, within our own borders and, second, in the Western Hemisphere.

During the last more than a quarter of a century established procurement practices have dangerously increased our dependence for the critical materials upon nations across major oceans without which this Nation cannot survive.

We must avoid dependence upon overseas suppliers to the extent that these suppliers could suddenly render us impotent by withdrawing supplies of critical materials during a world conflict, or could use such dependence as a political or economic bargaining lever.

Mines once closed down require years of time and tremendous investments to reopen. With experienced workers and technical staffs widely scattered, machinery liquidated, mines flooded and caved, much of our once available reserves are destroyed, and prospecting for new reserves is discouraged. Failure to realize the situation could mean tragedy to our economy and our material security.

I would suggest to this committee that the findings of the Malone Committee are still valid.

Should we not be looking to development of cobalt in existing Idaho mines and on the 40,000 acres set aside from the Idaho Wilderness, or in California or Missouri, rather than southern Africa?

When I look at the route the 78 million dollars' worth of cobalt we bought from Zaire (Shaba province) took to reach the GSA warehouses in Baltimore, I get the shivers. It went by rail from Shaba, pulled by South African locomotives, down through Zambia, over the Victoria Falls bridge into Zimbabwe, then into and through South Africa to the port of Durban. It was then loaded, and, I suspect, in foreign bottoms, for the 7500 mile (unprotectable) trip by sea to Baltimore. I have brought a chart of the Southern African Rail Net so that the Committee can see the "cobalt ride" pictorially and decide whether it's one they'd like to commute to work on. Looking at that route, it's no wonder the Malone Committee made the findings quoted above, back in 1954. (See Appendix B.)

Again, it seems to me the right of this Committee in itsoversight responsibility to ask who actually makes procurement decisions for the stockpile. Is it the Cabinet Council? GSA? FEMA? And are security of supply considerations weighed against,

for instance, invocation of Title III of the Defense Production Act to aid in development of domestic supplies" I suspect, were Sen. Malone, the long-ago Chairman of the Minerals, Materials and Fuels Economic Subcommittee of the Senate Interior Committee, to return to this body today, he would find much to criticize in our current stockpile procurement policies. As the French say, "Plus ca change, plus c'est la meme chose".

The President's Report designates the Cabinet Council as responsible for coordination of national materials policy but is not as explicit with respect to the Cabinet Council's responsibility for ongoing, focused program direction of the multi-agency efforts involved. If the Council has program implementation as well as policy responsibility, has it or its inter-agencies working group met for that purpose, and has a specific management plan been formulated? and, if so, with what assignments of tasks and milestones for completion" with what provisions for receiving periodic progress reports?

I was disappointed, and I know Senator Schmitt will be, that the word "education" was not used in the President's Report. In the book, "Strategic Minerals: A Resource Crisis," published by our council and furnished to this Committee, Senator Schmitt stated:

"Maybe one of the most serious problems we face is that of trained people. We have a deficiency of people with advanced degrees in the mineral industries, and related engineering and scientific professions, that is as serious as our dependence on mineral imports. The Science, Technology and Space Subcommittee, among its other activities, is examining this issue in great detail, and the preliminary estimates are that we have an annual shortfall in all science and engineering professions—an advanced-degree shortfall—of close to 15,000 young men and women a year."

I know this body under the leadership of Senator McClure saved the 1982 appropriation for our land-grant colleges, which have cognizance over materials disciplines, but what of the future? There certainly should be encouragement to solve the educational shortfall highlighted by Senator Schmitt.

Finally, there's an old baseball saying, "Who's on First?" that applies to each of the principal functional subheadings of the President's Report. Hard questions should be asked of administration witnesses as to "Who's on first" with respect to implementation and execution of each of the functional sections.

Cabinet Councils are fine for broad policy formulation, but my past experience with such bureaucratic organizations reminds me of the brobdingnagian monster in H. G. Wells' novel, "Walpole Island." That monster, when it wanted to brush a fly off its nose, would start its tail around and then forget halfway what it started for. Meanwhile, the fly would have departed.

APPENDIX A

STATEMENT OF THE PRESIDENT, FEBRUARY 1, 1982

[Extract]

"I am announcing today that the United States will return to (the Law of the Sea) negotiations and work with other countries to achieve an acceptable treaty. In the deep seabed mining area, we will seek changes necessary to correct those unacceptable elements and to achieve the goal of a treaty that:

Will not deter development of any deep seabed minerals resources to meet national and world demand;

Will assure national access to these resources by current and future qualified entities to enhance U.S. security of supply, to avoid monopolization of the resources by the operating arm of the International Authority, and to promote the economic development of the resources;

Will provide a decision-making role in the deep seabed regime that fairly reflects and effectively protects the political and economic interests and financial contributions of participating states;

Will not allow for amendments to come into force without approval of the participating states, including in our case the advice and consent of the Senate;

Will not set other undesirable precedents for international organizations; and

Will be likely to receive the advice and consent of the Senate. In this regard, the convention should not contain provisions for the mandatory transfer of private technology and participation by and funding for national liberation movements."

COUNCIL ON ECONOMICS AND NATIONAL SECURITY

[The Council on Economics and National Security (CENS) is a project of the National Strategy Information Center, Inc. (NSIC), which maintains offices in New York and Washington, D.C. Rear Admiral William C. Mott, USN (Ret.), serves as the Executive Director of CENS which is located in Washington at 1730 Rhode Island Avenue, N.W. (Suite 709). The President of NSIC since it founding twenty years ago is Mr. Frank R. Barnett.

NSIC is a nonprofit, tax-exempt organization established in 1962 to conduct educational programs in the area of national security and defense affairs. Espousing no political causes nor lobbying for any special interest group, NSIC has drawn its directors and officers from a broad range of responsible political opinion that includes both liberal and conservative viewpoints. What unites those who guide and participate in the programs of NSIC is the conviction that neither isolationism nor pacifism provides a realistic solution to the security challenges which confront the United States.

NSIC—and its project groups like CENS—exist to encourage the type of civil-military cooperation that is necessary in a democratic society to reenforce a viable defense posture by informing the private sector and the public at large on our nation's security interests and assisting the free countries of the world which aspire to maintain their independence through collective security agreements with the United States.]

CENS: STATEMENT OF PURPOSE

The central purpose of the Council on Economics and National Security (CENS) is to heighten the general awareness of business and industry circles to the interdependence of the economic health of our nation and the state of readiness of the national defense capabilities of the United States. The defense posture which the United States has maintain in the decades since the end of World War II has assured an opportunity for the western industrialized democracies and Japan to develop and grow politically and economically under an international system of free enterprise. This security and prosperity has also benefited a number of less developed nations around the world in the period of decolonialization that has followed the Second World War.

The current world situation presents a new, critical series of challenges to American industry, business and foreign trade. The very survival of our economic system stands in the balance due to certain critical international security issues at hand. Both the political convulsions in the Middle East and Persian Gulf region which exacerbate western energy concerns and the growing threat to our sources of strategic minerals in southern Africa illustrate just how national security is directly related to the economic well-being of the United States and the interests of the free world in general.

No longer are observers able to identify what it is that constitutes an "economic" as opposed to a "politico-military" consideration while, at the same time, the traditional distinction between the "domestic" and "international" spheres of action is becoming increasingly difficult to discern in most sectors of today's economically interdependent world. Just as our nation's economic well-being and a strong national defense are mutually dependent, there is also a very close relationship between the security of the free world and a healthy, growing international business community. It is at the nexus of these vital issues—economics and national security—that CENS functions to focus attention on a number of points that should concern businessmen and industrialists, the public at large, and our political leaders whose primary responsibility is the formulation of defense policy and plans.

The time has come for American businessmen to inform themselves about national defense matters that affect both the security and economy of the United States and, simultaneously, to bring these same concerns to the attention of their fellow citizens and elected officials. Toward stimulating that dual objective, CENS has embarked on educational programs over the last three years which serve to bring the following issues to the fore: National minerals policy and planning strategic minerals stockpiling management Law of the Sea Treaty seabed mining provisions technological innovations in materials substitution vulnerability of critical sources of minerals in southern African to Soviet expansionism, protection of the sea lanes for U.S. and allied merchant fleets that transport mineral resources and other related areas of concern such as the state of the U.S. industrial base and emergency preparedness measures required to meet the needs of the economy in times of mobilization.

Senator SCHMITT. Thank you.

Mr. Strauss.

Mr. STRAUSS. Thank you, Mr. Chairman.

My name is Simon Strauss. I am former vice chairman of ASARCO, Inc., which is a major mining company with operations both in the United States and in several foreign countries. I continue active as a consultant to the company and also to the American Mining Congress, a trade association representing the domestic minerals industry.

During the Second World War I served as an officer of the Metals Reserve Co., a Government corporation charged with the procurement of strategic materials for the war effort. So I have a deep familiarity with the problems posed by the dependence of national security on strategic materials.

On April 5, as you have already stated, President Reagan issued the national materials and minerals program plan and report to the Congress in compliance with the legislation that had been enacted in 1980.

The President's plan sets forth a broad outline on major mineral policy issues. However, although the report has now been available for something over 2 months, the principles set forth in the plan do not yet appear to have been implemented. This is very much along the lines of what Admiral Mott has just said.

As an example, the plan states that the minerals policy will be coordinated through the Cabinet Council on Natural Resources and Environment. The mining industry does not know how this Council will operate, how frequently it will meet and how mineral issues, which the industry feels are important, can be brought to the at-

tention of the Council. So we don't know how we are supposed to proceed under this plan.

Now perhaps the closest approach to a specific administration statement on minerals policy that I have seen since the appearance of the plan is contained in the letter from David Stockman, Director of the Office of Management and Budget dated May 5, 1982, which was addressed to Congressman Stanton and this letter was printed in a report by the House Committee on Banking, Finance and Urban Affairs.

In commenting on H.R. 5540, which is a bill to extend and implement the Defense Production Act, Mr. Stockman indicates that he has difficulty in supporting the bill for two reasons.

The first of these is that it is administration policy to rely on the marketplace to improve the competitiveness of our industries and thereby reduce reliance on foreign sources.

The second point is that the strategic stockpile provides substantial additional protection to insure that defense material needs can met in case of declared national emergency.

I should like to discuss both these points.

Private industry in this country and the present administration are both committed to the principle of free markets. However, the domestic mineral industry produces commodities that respond to world market factors. Production, consumption, prices, international trade in these materials are all determined by worldwide conditions.

The U.S. Government may feel, as Mr. Stockman says, that the marketplace should govern trends in these minerals. This is not the real world, however. The governments of most major mineral-producing countries support their domestic industries in various ways that disregard market conditions.

For reasons of national policy they assist domestic producers through grants, export assistance, low-cost loans and other measures. Many major mining enterprises are now in the hands of government corporations which maintain production regardless of the financial outcome. So we are not competing in a marketplace where economics determines who produces.

Just the other day the press announced, for example, that the largest mining enterprise in France is being taken over by the French National Government.

Local governments desire to maintain employment or they desire to continue to earn foreign exchange. To say that the U.S. mining industry should compete in the marketplace on equal terms with these people is completely unrealistic.

Senator SCHMITT. Excuse me, doctor, very quickly, do you think the GATT recognizes this distinction you just made? Every time I ask for some look at this problem I get GATT thrown in my face.

Mr. STRAUSS. It does not, sir. I was an advisor to the ISAC-12 which dealt with minerals on the GATT and the points that we made with respect to this issue were completely——

Senator SCHMITT. So it was negotiated without recognizing the difference between price and market?

Mr. STRAUSS. Well, it may have been recognized, but the final result didn't give any influence to it.

Senator SCHMITT. Thank you, sir.

Mr. STRAUSS. As a consequence, despite the measures mentioned in this Stockman letter as intended to strengthen the U.S. materials posture, the domestic minerals industry is in fact undergoing severe attrition. Domestic mines are closing. Last week the largest silver mine in the country, the Sunshine Mine, announced it was closing. Every mine operated by Phelps Dodge, the country's second largest copper producer, has been closed. Many of the mines that continue to operate are increasingly exporting their products to foreign processing plants to smelt and refine their materials because of the drastic curtailment in domestic processing operations.

In the interest of brevity I am not going to incorporate details in this statement, but I am prepared to provide chapter and verse in support of these statements should the committee desire specifics.

The United States cannot ignore these harsh realities of the world minerals scene today. There is no such thing as a free marketplace and we are not being judged as to whether we are economically viable in relation to our foreign competitors because they are not operating under the same standards of a free marketplace.

The American Mining Congress supports H.R. 5540 because in previous periods of crisis, including both the Korean and the Vietnamese Wars, the price supports and loan guarantees then made available under DPA resulted in the expansion of domestic mineral production; in other words, in reducing our dependence on imports.

Today domestic mineral production is not expanding. It is contracting. U.S. reliance on imports is steadily increasing. Unless steps are taken to equalize the competitive position of the domestic producers, a further drastic reduction in domestic mineral output appears inevitable.

Within recent weeks Senator Domenici and Representative Santini have circulated to the Senate Environment and Public Works Committee and the House Mines and Mining Subcommittee a detailed report on the international competitiveness of the U.S. nonferrous smelting industry. Here is the report. It tells the sad story. It spells out what has happened to the domestic processing industry.

Mr. Stockman's statement also refers to the substantial additional protection provided to the domestic defense and industrial establishments through the strategic stockpile. The latest stockpile reports indicate that the stockpile contains by value less than half of the quantities determined by the administration itself to represent an adequate stockpile.

In 24 highly critical elements stockpile holdings are less than half the goals which the Government itself has set. In certain cases the stockpiles contain 5 percent or even none of the objectives. So to say that the stockpile is today a protection is simply not the case.

Mr. Stockman says "Planned stockpile acquisitions will further improve this protection." However, the funds available for stockpile purchases are pitifully small. In his statement of April 5, 1982, the President referred to the expenditure of $100 million for the first major addition to the stockpile in over 20 years. Of this more than three-quarters was used to purchase a single commodity, cobalt, and Admiral Mott has described to you where the cobalt

came from. And this purchase represents less than 15 percent of the perceived shortage in our stockpile of cobalt.

Senator SCHMITT. Dr. Strauss, I hate to interrupt, but could you summarize and then maybe we can get to some of these points in the questions.

Mr. STRAUSS. Right. I am getting very close to the end of my prepared statement.

The quantity requested for fiscal year 1982 was limited to an additional $106 million. The deficit is $14 billion. It would take a 100-plus years to fill the stockpile.

The mining industry has suggested in the past that consideration should be given to establishing a Government-owned corporation comparable with Comsat or Fannie Mae to operate the stockpile. Our reason for suggesting that is that such a corporation would have its own balance sheet and it would be less affected by budgetary considerations than the present procedures.

I have to point out, sir, that the stockpiles are materials which have a permanent value and, unlike sophisticated military weapons, they do not become obsolete. None of these materials will lose their value. On the contrary, their value increases.

Now we see very little progress being made toward real improvement in the country's alarming dependence on supplies of strategic materials. The allies of the United States, Western Europe, and Japan do face similar problems, but these are countries without the vast mineral potential of the United States.

The United States does not need to be so heavily dependent on imports if the mineral potential lying under our soil were more fully exploited. We must recognize the fact that the strict economic criteria that Mr. Stockman refers to is an unrealistic way of measuring which of our mineral deposits should be operated simply because of the artificial ways in which mineral production in other countries is being stimulated.

Thank you for your attention.

[The statement follows:]

STATEMENT OF SIMON D. STRAUSS, CONSULTANT, AMERICAN MINING CONGRESS

My name is Simon D. Strauss. I am the former Vice Chairman of ASARCO Incorporated, a major mining company with operations in the United States and in several foreign countries. I continue active as a consultant to the company and also to the American Mining Congress, a trade association representing the domestic minerals industry. During the Second World War I served as an officer of the Metals Reserve Company, a government corporation charged with the procurement of strategic materials for the war effort.

I appear today to discuss issues in relation to the domestic minerals industry. On April 5, 1982, President Reagan issued the "National Materials and Minerals Program Plan and Report to Congress." This was in compliance with legislation enacted by Congress in 1980.

The President's Program Plan sets forth a broad outline on major minerals policy issues. However, although the report has now been available for something over two months, the principles set forth in the plan do not yet appear to have been implemented. As an example, the plan states that minerals policy will be coordinated through the Cabinet Council on "Natural Resources and Environment." The industry does not know how this Council will operate, how frequently it will meet, and how mineral issues can be brought to its attention by the industry.

Perhaps the closest approach to a specific Administration statement on minerals policy since the appearance of the Plan is contained in a letter from David Stockman, Director of the Office of Management and Budget, dated May 5, 1982, addressed to Congressman Stanton.

In commenting on H.R. 5540, a bill to extend and implement the Defense Production Act, Mr. Stockman indicates that he has difficulty in supporting the bill for two reasons.

The first of these is that it is Administration policy "to rely on the marketplace to improve the competitiveness of our industries and thereby reduce reliance on foreign sources."

The second point is that the strategic stockpile "provides substantial additional protection to insure that defense material needs can be met in case of declared national emergency."

I should like to discuss both points.

Private industry in this country is committed to the principle of free markets. However the domestic mineral industry produces commodities that respond to world market factors. Production, consumption, prices and international trade in these materials are determined by worldwide conditions.

The U.S. Government may feel that the marketplace should govern trends in these minerals. However, governments of most of the major mineral producing countries support their domestic industries in various ways that disregard market considerations. For reasons of national policy they assist their domestic producers through grants, export assistance, low-cost loans and other measures. Many foreign major mining enterprises are not in the hands of government corporations which maintain production regardless of sustantial losses. This reflects the desire of the local governments to maintain employment or to continue to earn foreign exchange.

Thus the industry in the United States is not competing on equal terms with producers operating elsewhere. As a consequence, despite the measures mentioned in the Stockman letter as intended to strengthen the U.S. materials posture, the domestic minerals industry is in fact undergoing severe attrition. Domestic mines are closing. Many mines that continue to operate are increasingly exporting products to foreign processing plants to smelt and refine their materials because of the drastic curtailment in domestic processing operations.

In the interest of brevity I am not incorporating details in this statement but I am prepared to provide chapter and verse in the support of these statements should the Committee desire specifics.

The United States cannot ignore the harsh realities of the world minerals scene today. The American Mining Congress supports H.R. 5540 because in previous periods of crisis—including the Korean and Vietnam Wars—the price supports and loan guarantees then made available under DPA resulted in expansion of domestic mineral production.

Today, domestic mineral production is not expanding. It is contracting. U.S. reliance on imports is steadily increasing. Unless steps are taken to equalize the competitive position of the domestic producers, a further drastic reduction in domestic mineral output appears inevitable.

Within recent weeks Senator Domenici and Representative Santini have circulated to the Senate Environment and Public Works Committee and the House Mines and Mining Subcommittee a detailed report on the International Competitiveness of the U.S. Non-Ferrous Smelting Industry. This spells out what has happened to the domestic processing industry.

Mr. Stockman's statement refers to the substantial additional protection provided to the domestic defense and industrial establishments through the strategic stockpile. The latest stockpile reports indicate that the stockpile contains, by value, less than half of the quantities determined by the Administration itself to represent an adequate stockpile.

In 24 highly critical elements stockpile holdings are less than half the goals which the government itself has set. In certain cases, the stockpile contains 5 percent or less of the objectives.

Mr. Stockman says, "Planned stockpile acquisitions will further improve this protection." However, the funds available for stockpile purchases are pitifully small. In his statement of April 5, 1982, the President referred to the expenditure of $100 million for the first major addition to the stockpile in over 20 years. Of this more than three-quarters was used to purchase a single commodity—cobalt. The quantity requested for fiscal year 1982 was limited to an additional $106 million. These figures are miniscule in relation to a deficit estimated at $14 billion. Therefore the improvement to which Mr. Stockman referred is far short of what is needed.

Congress some years ago enacted a provision that proceeds from stockpile sales would be earmarked for stockpile purchases. However, such proceeds under present procedures cannot be spent until and unless the Congress authorizes expenditures. Thus far this statutory obstacle has not been dealt with.

Expenditures for the stockpile are in a very different category from the great bulk of government expenditures.

Materials in the stockpile are valuable assets. Expenditures on them are therefore more akin to capital expense than to governmental operating expense. Unlike defense weapons, basic materials do not become obsolete.

For these reasons the mining industry has suggested in the past that consideration should be given to establishing a government-owned corporation, comparable with Comsat or Fannie Mae, to operate the stockpile. It would have its own balance sheet that would not affect budget surpluses or deficits.

In any case the Committee must realize that the present mining position is one of a domestic industry declining in the face of competition from overseas. The stockpile is both unbalanced and inadequate. Despite the good intentions expressed in the President's plan, the mining industry sees little progress being made toward a real improvement in the country's alarming dependence on supplies of strategic materials from overseas sources, many of them representing countries with political instability or with regimes hostile to the United States.

The allies of the United States in Western Europe and Japan face similar problems, but these are countries without the vast mineral potential of the United States.

The United States need not be so heavily dependent on imports if the mineral potential lying under our soil were more fully exploited.

Senator SCHMITT. Thank you.

Mr. Manly.

Mr. MANLY. Mr. Chairman, I am pleased to appear before you today on behalf of the Cabot Corp. to discuss the national strategic minerals and materials policy.

My name is William D. Manly. I am the senior vice president of Cabot Corp. in charge of its engineered products group which is in the specialty metals business. I am also a past chairman of the National Materials Advisory Board.

Cabot, like the Nation, depends on raw materials from many outside sources and a number of these are potentially unstable nations in southern and central Africa.

From the outset I would like to strongly echo the fact that the strategic minerals and materials problem is a serious national issue.

However, I believe the problem is manageable. In my opinion, a great deal can be accomplished in a short period of time if there is proper industry-Government cooperation—cooperation that has been inadequate in the past.

The issues surrounding a national materials policy are numerous and complex—capital formation, tax policy, trade policy, antitrust laws, and the like. The President's plan provided a broad framework for addresssing these issues. The next step is the implementation of an effective program. It involves the close cooperation of industry, Congress, and the administration.

As a result of Cabot's concern about the minerals and materials policy, we undertook a comprehensive review of particular metals important to the Cabot Corp., some 10. The study was completed in April, and I am pleased to make a copy of that study available for the record.

Senator SCHMITT. Without objection, it will be included in the record.

Mr. MANLY. Thank you.

The study concluded there are some simple cost-effective actions the Government could take under existing authority to ease the problem. I would like to review a few of these with you today.

First of all, I would like to address the importance of the U.S. Government defense stockpile.

Much has been said about the need to review the quality and the quantity and the form of the materials in the stockpile. We agree with the assessment. Something should be done. The Government should immediately assay all of the materials in the stockpile. This also has been called to the attention of the administration through the report from the National Materials Advisory Board which looked at some eight elements.

A major problem with the stockpile is that we have insufficient data about the usefulness of many of the materials in it. For example, as producers we do not know for certain the compatibility between stockpile minerals and established industry processes. Therefore, the Government should not make additional purchases until they know whether what is in the stockpile now is readily amendable to these processing steps.

The administration study addresses this issue by setting up a panel to make recommendations for changes. Unfortunately, this could take months and possibly years to implement. As yet the panel participants have not been selected. The important question is why wait?

An alternate approach might be for the individual industry producers or manufacturing associations to undertake a Government-sanctioned study of the most critical materials and spreading the cost among these industries. This would circumvent the congressional appropriation process, cost the Government nothing, assure unbiased results and, most important, get the job done now.

Let me now briefly turn to two minerals which highlight the overall recommendations of efficient management of the stockpile.

The chromium situation is critical. Our domestic processing industry is declining and the stockpile is being held in the wrong forms. We must either change the form of the stockpile or begin to help the processing industry.

Chromium is necessary in the production of steels, stainless steel and all the high nickel-based and cobalt-based alloys used for most jet aircraft. Chromium is the only form of the metal that can be used in super-alloys and there are no known substitutes.

Chromite ore is produced primarily in South Africa, Zimbabwe and the Soviet Union.

Low-cost ferrochrome production and its highly competitive pricing policy for ore in the export market has made our Nation's ferrochrome industry less competitive, the same situation that now exists in Japan and Western Europe. If something is not done about the ferrochrome situation, then manufacturing in the world's heavily industrialized nations could come to a halt.

Given the political climate in the important producing countries, we believe that a moderate supply disruption at the mine level is likely to occur in this decade and you may even have a very serious disruption in the next 10 years. Again, we need to look at stimulating ferrochrome production or getting the proper mix in the stockpile.

Cobalt has been mentioned several times today.

There has been considerable discussion about the quality of the cobalt in the stockpile. People have appeared before various hear-

ings here in Congress to say that the material in the stockpile cannot be used since it is of such poor quality. There have been considerable changes in the way people melt and make materials available for melting shops due to the argon/oxygen device in most melt shops. With these current melting techniques the somewhat impure cobalt that now exists in the stockpile could be used in the manufacture of super alloys.

In addition to improving the management of the public stockpile, it is my opinion that the Federal Government should strongly consider using private stockpiling as a resource. In a time of serious Federal budget cutbacks private stockpiling could provide a low-cost, reliable supplement to our current public defense stockpile. The administration's policy paper did not address this in any detail. It deserves a closer look. The use of private stockpiling for several materials should be explored at least on a trial basis.

An effective program could be developed using either provisions of title III of the Defense Production Act or tax subsidies—to encourage industry's cooperation in holding minimum stocks that could be dedicated to Government use during an emergency. If the Government is serious about meeting the stockpile goals, private stockpiling is an excellent way to get there. In general, private stockpiling has two advantages. It can be less expensive than government stockpiles because of reduced acquisition and carrying costs. And because companies are intimately acquainted with the materials used in their own manufacturing processes, there is a higher probability that the quantity, quality, and form of the stockpile will be optimum at any given time, that inventories will be rotated properly and that accurate records and analyses will be effectively maintained.

There is nothing new about private stockpiles. Many foreign governments such as France, Germany, Japan, Sweden, and Switzerland have such stockpiles and I think it is something that we as a Nation should try to encourage.

The same is true in mining. The previous two speakers supported the use of the Defense Production Act for domestic mining, such as for cobalt. There is no better stockpile than having a mine that is readily available to produce this material in a time of need for our Nation.

So the message I would like to leave with you is there are many things we can do today to improve our position in the minerals area by using existing authority and industry is ready to do its part. Thank you.

[The statement and material referred to follow:]

STATEMENT OF WILLIAM D. MANLY, SENIOR VICE PRESIDENT, CABOT CORP.

Mr Chairman and members of the committee: I am pleased to appear before you today on behalf of Cabot Corporation to discuss national strategic minerals and materials policy. My name is William D. Manly. I am Senior Vice President of the Engineered Products Group of Cabot Corporation. I am also a past chairman of the National Materials Advisory Board.

Cabot Corporation is a Boston-based manufacturer with annual sales in 1981 of $1.6 billion. Approximately one-third of Cabot's revenues come from our specialty metals business. Cabot manufactures high-performance nickel- and cobalt-based alloys for heat-, corrosion- and wear-resistant applications; tantalum and columbium products for the electronics and metallurgical markets; and aluminum-based master alloys and beryllium-copper alloys.

The origins of the Cabot specialty metals business are over fifty years old; and Cabot is now a major worldwide supplier of these specialized products so essential to our national security. The markets for Cabot's specialty metals products grew more than five-fold in the decade of the seventies, and our specialty metals product line more than tripled during the same period. It now includes 1,200 combinations of alloy composition and product form.

Cabot, like the nation, depends on raw materials from outside the U.S., a number of them from potentially unstable nations in southern and central Africa. Therefore, government actions affecting national minerals security also affect Cabot directly. The question of minerals availability is an important element in our daily operating environment.

From the outset, I would like to strongly echo the fact that the strategic minerals and materials problem is a serious national issue. The U.S. has virtually no primary production of the following key defense materials: chromium, cobalt, columbium, manganese, platinum group metals, tantalum—all of which are required in our products.

However, I believe the problem is manageable. In my opinion, a great deal can be accomplished in a short period of time with the proper industry-government cooperation—cooperation that has been inadequate in the past.

The issues surrounding a national minerals policy are numerous and complex. Capital formation, tax policy, trade policy, antitrust laws, environmental health and safety regulations, access to public lands, and technological innovation must each be considered as part of any comprehensive non-fuels minerals policy. The President's plan provided a broad framework for addressing these issues. The nextstep—the implementation of an effective program—involves the close cooperation of industry, Congress and the administration.

As a result of our concern about the minerals and materials issue, we recently undertook a comprehensive review of Cabot's particular mineral needs—beryllium, chromium, cobalt, columbium, tantalum, titanium—and of the nation's requirements for minerals in general. The result is a study completed in April which I would like to include in the record. The study concluded that there are some simple, cost-effective actions that the government can take under existing authority to ease the problem. I would like to review a few of these with you.

First, I would like to address the importance of the U.S. government defense stockpile.

Our study concluded that in the short term, the most visible requirement of a non-fuels minerals policy is the efficient management of the materials stockpile. A sound minerals stockpile policy is an essential element of a national security policy. The stockpile is the area of minerals management in which the federal government has the greatest flexibility.

Much has been said about the need to review the quality, quantity and form of the materials in the stockpile. We agree with the assessment. The government should immediately assay all materials in the defense stockpile. The GSA, which manages the stockpile, has insufficient data about the usefulness of many of the materials in the stockpile, including cobalt, beryllium and tantalum. For example, as producers we do not know for certain the compatibility between stockpile minerals and established industry processes. Therefore, the government cannot readily determine what additional purchases might be required to make the stockpile fully effective for those materials.

The administration study addresses this issue by setting up a panel to make recommendations for changes. Unfortunately, this could take months and possibly years to implement. The panel participants have not even been selected yet. The important question is, why wait?

An alternative approach might be for the individual industry producers or manufacturing associations to undertake a government-sanctioned study of the most critical materials, spreading the cost among industries. This would circumvent the volatile congressional appropriations process, cost the government nothing, assure unbiased results and, most important, get the job done quickly.

Let me talk briefly about specific minerals which highlight our overall recommendations for the efficient management of the stockpile.

CHROMIUM

The chromium situation is critical. Our domestic processing industry is declining and the stockpile is being held in the wrong forms. We must either change the form of the stockpile or begin to help the processing industry.

Chromium is used primarily in the manufacture of stainless and other specialty steels, to which it is added in the form of ferrochrome to enhance various physical properties, especially resistance to corrosion or oxidation. Chromium in the form of metal is also an important ingredient in the production of most super alloys. In these applications, it generally has no known substitutes.

Chromium ore (chromite) is produced primarily in South Africa, Zimbabwe and the Soviet Union. Lack of substitution capability in steel and super alloys, togethern with the fact that production is concentrated in souther Africa has led chromium to be regarded as one of the most important of "strategic materials" in terms of reliable long-term supplies.

Low-cost South African ferrochrome production and their highly competitive pricing policy for ore in export markets is making other nations' ferrochrome less competitive, particularly in the U.S., Japan and Western Europe. The eventual result could be the drastic reduction in ferrochrome production by the world's heavily industrialized nations. That would force users to rely even more heavily upon South African and other ferrochrome producers of questionable long-term stability.

Given the political climate in the important producing countries, we believe a moderate supply disruption at the mine level is likely to occur during the decade, and we acknowledge that a severe disruption is possible. At the moment, domestic ferrochrome processing capacity can supply very little of annual domestic needs. Again, clearly we must help the ferrochrome industry or change the stockpile mix.

COBALT

In recent years, cobalt has become something of a symbol of our strategic dilemma. This is primarily due to our dependence for cobalt on two potentially unstable central African nations.

It is our opinion that the stockpile is already adequate to meet a three-year wartime demand for cobalt in its more important applications. In a period of strong industrial demand and military buildup, it is unlikely that the annual demand for cobalt would exceed 15–17 million pounds. The current inventory levels of around 46 million pounds are reasonable and the goal of 85 million pounds could be substantially reduced without any erosion of national security. The potential savings might be as much as $350 million, based on the current price of $9 per pound.

In addition, we believe it is important to set the record straight on the quality of the cobalt in the stockpile. Contrary to frequent allegations, we do not consider that the material in the stockpile is of such poor quality that it cannot be readily used. Although the material does contain certain impurities, current melting techniques used by most super alloy manufacturers would generally produce a refined product. A good proportion of the stockpiled cobalt probably could be used in the production of super alloys, although I acknowledge that only the recently purchased Zairian material would be applicable to the specialized requirements of rotating turbine parts.

In addition to improving the management of the public stockpile, it is my opinion that the federal government should strongly consider using private stockpiling as a resource. In a time of serious federal budget cutbacks private stockpiling could provide a low-cost, reliable supplement to our current public defense stockpile. The administration's policy paper did not address this in any detail. It deserves a closer look. Private stockpiling of certain minerals for defense purposes only should be explored even if only on a trial basis.

An effective program could be developed using either provisions of Title III of the Defense Production Act or tax subsidies—to encourage industry's cooperation in holding minimum stocks that could be dedicated to government use during an emergency. If the government is serious about meeting the stockpile goals, private stockpiling is an excellent way to get there. In general, private stockpiling has two advantages. It can be less expensive than government stockpiles because of reduced acquisition and carrying costs. And because companies are intimately acquainted with the materials used in their own manufacturing processes, there is a higher probability that the quantity, quality and form of the stockpile will be optimum at any given time, that inventories will be rotated properly and that accurate records and analyses will be effectively maintained.

There is nothing new about private stockpiles. We believe such a program could be easily established. Many foreign governments have examined the use of private defense stockpiles, including France, Germany, Great Britain, Japan, Sweden and Switzerland. Switzerland has successfully implemented such a program, and in September a Japanese government panel announced plans to establish a joint public/

private stockpile in 22 critical materials, including beryllium, cobalt, chromium, molybdenum, nickel, titanium and zirconium. France elaborate plan as well.

Finally, we believe the government should take a hard look at helping several areas of the domestic mining industry. Encouragement of cost-effective domestic mining is just another approach to private stockpiling—one stockpile is at the plant and the other is at the time. If designed correctly, government assistance for certain mines through the DPA might be a cheaper alternative to additional purchases or the cost of holding existing material. In addition, it might offer greater flexibility, including a possible reduction in some of the existing stockpile inventory. Domestic cobalt mines are a frequently cited example. For some reason, we as a nation continue to overlook this opportunity.

The message I would like to leave you with is this: There are many things we can do today to improve our position in the minerals area under existing authority. Let's not get bogged down in bureaucracy. We can get on with the job by using some common sense. Industry is ready to do its part. We are asking for your help in the effective implementation of a thoughful policy. Thank you very much for the opportunity to appear before you today. I would be pleased to answer any questions you may have.

Cabot Corp., Strategic Minerals Study

Cabot Corporation is a Boston-based manufacturer with annual sales in 1981 of $1.6 billion. Approximately one-third of Cabot's revenues come from our specialty metals business. Cabot manufactures high-performance nickel and cobalt-based alloys for heat-, corrosion- and wear-resistant applications; tantalum and columbium products for the electronics and metallurgical markets; and aluminum-based master alloys and beryllium-copper alloys.

The origins of most of the Cabot specialty metals business are over fifty years old; and Cabot is now a major worldwide supplier of these specialized products so essential to our national security.

Starting with the acquistion of the Stellite Division from Union Carbide in 1970, Cabot built a strong base of high-temperature, corrosion-resistant and wear-resistand alloys. The acquisition of Kawecki Berylco Industries in 1978 added tantalum, columbium beryllium-copper and aluminum master alloys. Deloro Stellite, purchased in 1980, expanded wear-resistant products to a worldwide business, while Cabot Mineral Resources, also established in 1980, provided a central source for coordinated purchasing of raw materials. The markets for Cabot's specialty metals products grew more than five-fold in the decade of the seventies, and our specialty metals product line more than tripled during the same period. It now includes 1,200 combinations of alloy composition and product form.

Cabot, like the nation, depends on raw materials from outside the U.S., a number of them from potentially unstable nations in southern and central Africa. Therefore, government actions affecting national minerals security affect Cabot directly.

The issues surrounding a national minerals policy are numerous and complex. Capital formation, tax policy, trade policy, antitrust laws, environmental health and safety regulations, access to public lands, and technological innovation must each be considered as part of any comprehensive non-fuels minerals policy.

In the short term, the most visible requirement of a non-fuels minerals policy is the efficent management of the critical materials stockpile. a sound minerals stockpile policy is an essential element of a national security policy. The stockpile is the area of minerals management in which the federal government has the greatest flexibility.

Cabot Corporation does not have ready answers to all of the complex questions which make up a non-fuels minerals policy. However, we can offer some broad suggestions to assist in management of the critical materials stockpile. In addition, we have some simple, cost-effective recommendations on immediate actions that can be taken with regard to six metals which are of major importance to Cabot's operations—beryllium, chronmium, cobalt, columbium, tantalum and titanium. Many of our recommendations could be implemented administratively or under currently established congressional approval processes.

(1) The government should assay all materials in the defense stockpile. The GSA, which manages the stockpile, has insufficient data about the usefulness of many of the materials in the stockpile, including cobalt, beryllium and tantalum. For example, we do not know for certain the compatibility between stockpile minerals and established industry processes. Therefore, we cannot readily determine what additional purchases might be required to make the stockpile fully effective for those materials.

The government should comprehensively review the quantity, form and material specifications of the stockpile, revising goals as much as possible to allow for adequate protection and continuous production in the event of a shortage. Inferior materials should be refined or sold and replaced. Excess material should be sold or exchanged for other materials in deficit positions. The review should concentrate on the need to stockpile the optimum mix of forms. This will depend on the nature of the material, production from domestic sources and neighboring nations, and relevant military and industrial applications. An assessment should be made of materials flow from ore to finished product, the risk of disruption and the relative economics of the various alternatives. For example, where there exists strong domestic capability to quickly produce metal from ore, it makes good economic and operating sense to stockpile ore—e.g., rutile. Conversely, where domestic processing capability is weak or limited to a single manufacturer, such as in the beryllium industry, it would be more appropriate to hold such a material close to its end-use form.

(3) Private stockpiling of certain minerals should be explored even if only on a limited trial basis, using either provisions of Title III of the Defense Production Act or tax subsidies to encourage industry's cooperation in holding minimum stocks that could be dedicated to government use during an emergency. In general, private stockpiling has two advantages. It can be less expensive than government stockpiles because of reduced acquisition and carrying costs. Furthermore, because companies are intimately acquainted with the materials used in their own manufacturing processes, there is a higher probability that the quantity, quality and form of the stockpile will be optimum at any given time, that inventories will be rotated properly and that records and analyses will be effectively maintained.

National defense objectives would not be compromised under a lower-cost private stockpiling plan. In fact, some private stockpiling may be the best alternative. According to the Bureau of Mines, it would cost between $7 and $12 billion, based on mid-1981 materials prices, to meet the current stockpile goals. At the current annual appropriations level of $100 million, it could take 120 years to reach the stated goals. In a number of instances, government financial incentives may increase stocks to a level where no public stockpiling is required.

Many foreign governments have examined the use of private defense stockpiles, including France, Germany, Great Britain, Japan, Sweden and Switzerland. Switzerland has successfully implemented such a program and in September, a Japanese government panel announced plans to establish a joint public/private stockpile in 22 critical materials, including beryllium, cobalt, chromium, molybdenum, nickel, tantalum, titanium and zirconium.

(4) The Defense Production Act (DPA) could be used to encourage cost-effective domestic mining. Orginally passed in 1950 and renewed in 1981, the DPA is the sole statutory vehicle for ensuring that the nation's industrial base is kept in a state of readiness in peacetime so that the nation is prepared in the event of an emergency.

Title I of the Act empowers the President to require expedited performance on qualifying national defense or domestic energy contracts and to allocate scarce and critical materials. Under Title III, the Act provides authority to guarantee and make loans, to make purchase commitments, and, under certain conditions, to develop productive capacity in special industries where it may be required for national defense purposes. During the Korean War period, DPA programs under Title III had a dramatic impact on the increased supply of a number of strategic minerals.

The creation or enlargement of domestic productive capacity, if it can be done at reasonable costs, will in most cases offer greater fleibility than stockpiles. In fact, under current planning whereby three years' wartime consumption of a material is required, it follows that one additional ton of domestic production would replace three tons of requried inventory. Therefore, subsidization of certain mines through the DPA might be a cheaper alternative to additional purchases or maintenance of existing material. An approach could be developed to ensure that financing costs of subsidizing domestic production could be lower than maintaining the stockpile.

For example, the Blackbird mine in Idaho has the potential to produce 4 million pounds of cobalt per year; that is, each year it could produce almost 10 percent of current stockpile inventory and thereby eliminate the need for 30 percent of current material. Possible savings, based on an example of just one scheme for support of production from this mine, are projected in the section on cobalt.

SPECIFIC RECOMMENDATIONS BY MINERAL

BERYLLIUM

Beryllium is a hard, light metal with practical applications in its metallic and oxide forms and as an alloying element with cooper. Production of beryllium-cooper master alloy for the electronics industry currently accounts for about 70 percent of overall beryllium usage. Beryllium metal, in nuclear weaponry and advanced aerospace applications, accounts for about 20 percent of total demand. Beryllium oxide for ceramics, also primarily destined for aerospace or weapon use, accounts for the remaining 10 percent. Military applications are estimated to make up roughly 20% of total beryllium demand. The Cabot Berylco Division of Cabot Corporation is one of the three suppliers of beryllium products in the free world.

Beryllium products are derived from two raw materials: "High grade" (10 percent plus BeO) beryl ore—100 percent imported, primarily from China, Brazil and various African nations. Bertrandite—100 percent of the world's supply produced at Brush Wellman's mine in Utah.

All beryllium raw materials are processed into the intermediate product beryllium hydroxide [$Be(OH)_2$] at Brush Wellman's plant in Delta, Utah—close to the bertrandite mine. It is the only beryllium processing plant in the western world. It has production capacity (expressed in terms of Be oxide) of 1.25 million pounds of BeO per year from bertrandite, plus 1 million pounds of BeO per year from beryl ore.

The U.S. is potentially self-sufficient both in beryllium raw materials and processing capability, as the following table demonstrates.

Pounds (thousands)

Material	Approximate annual current consumption (pounds)		Maximum that can be met from domestic raw materials (pounds)	Domestic shortfall (pounds)
	Tons	BeO equivalent		
Be metal	28	200		
4 percent BeCu master alloy	3,800	940	1,250	50
BeO—ceramic grade	80	160		
Total		1,300	1,250	50

The reserves of bertrandite in Utah are extensive. Currently about 80 percent of all beryllium end products are derived from this domestic source. The remaining production comes from imported beryl ore.

The current status of the national stockpile and its relationship to current demand is shown below.

BERYLLIUM STOCKPILE DATA

Material	Stockpile goal quantities		Actual inventories (thousands of pounds)	Attainment of goal (percent)	Current annual usage (thousands of pounds)	Years supply at current consumption
	Tons	BeO equivalent (thousands of pounds)				
Be metal	400	2,778	1,590	54	200	8.0
4 percent be master alloy	7,900	1,951	1,824	93	940	1.9
BeO—ceramic grade	0	0	0	0	160	
Beryl ore	18,000	3,168	3,166	100	(1)	(1)
Total			6,580		1,300	5.1

(1) Already included in usage statistics of final products.

Direct comparison between current inventory and goals would indicate that some purchases of metal and BeCu master alloy are required. However, comparison of the goals with actual use and with domestic production capability suggest to us that the goals are significantly overstated and reductions in certain stockpile materials could be made. This conclusion is even more evident when one considers the relatively

small military requirement for beryllium and the fact that the military demand relates primarily to nuclear rather than conventional war. It appears to us that goals for metal stocks are greatly overstated and master alloy is more than adequately provided for relative to domestic capacity. However, some addition of ceramic grade BeO might well be considered when the stockpile goals are reviewed. Carrying major quantities of raw material in the form of beryl ore appears redundant.

Ideally, the beryllium stockpile should reflect optimum preparedness at minimum cost as well as the strategic concern stemming from the U.S.'s reliance on only one ore processing plant. This would reflect in most of the stockpile being held in lower-cost $Be(OH)_2$ as well as sufficient end products (beryllium metal and master alloy) to allow for the process time of $Be(OH)_2$ to produce those end products.

Unfortunately, to adjust the stockpile in these ways may be impractical. Disposal of beryllium metal and master alloy materials from the stockpile could disrupt the market for these products, a result prohibited by the Stockpiling Act. Beryl ore from foreign sources, on the other hand, is in relatively short supply and both the market and the federal government might benefit from stockpile disposal. Excess ore disposal could generate up to $30 million in funds and would also add greater emphasis to the presence of end products in the stockpile, thereby responding to the concern that all raw materials processed currently rely on one plant.

Finally, Cabot's detailed data on the beryllium stockpile material indicates that most of the metal is of poor quality and will probably require additional refining before use. In order to provide for immediate requirements, some upgrading of beryllium metal should be undertaken.

CHROMIUM

Chromium is used primarily in the manufacture of stainless and other specialty steels, to which it is added in the form of ferrochrome to enhance various physical properties, especially resistance to corrosion or oxidation. Chromium in the form of metal is also an important ingredient in the production of most super alloys. In these applications, it generally has no known substitutes.

Chromium ore (chromite) is produced primarily in South Africa, Zimbabwe and the Soviet Union. Albania, Turkey, the Philippines and a number of other nations are significant secondary sources. Lack of substitution capability in steel and super alloys, together with the fact that production is concentrated in southern Africa, has led chromium to be regarded as one of the most important of "strategic materials" in terms of reliable long-term supplies.

A brief analysis of the status of the national stockpile and current U.S. consumption patterns is outlined and attached.

As can be seen in the table below, chromium is consumed and stockpiled in a variety of different forms. In total, chromium units stockpiled are fairly close to established goals, which, in turn, approximate four years' average peacetime consumption. There are, however, a number of anomalies within the overall mix of materials held which are worthy of comment.

CHROMIUM—STOCKPILE AND ANNUAL CONSUMPTION DATA (UNITED STATES)

[Tons Cr content]

Form	Approximate annual U.S. Consumption	Stockpile goal	Current stockpile inventory	Achievement toward goal (percent)	Years supply (inventory/U.S. annual usage) (months)
Metal	7,500	20,000	3,800	19	6
Ferrochrome (Hi-C) [1]	248,000	120,000	238,000	198	12
Ferrochrome (Lo-C) [2]	69,000	50,000	218,000	435	33
Ferrochrome (Silicon) [3]	10,000	36,000	22,000	60	25
Chromite (Met grade) [4]	[5] 194,000	1,044,000	803,000	77	50
Total	334,500	1,250,000	1,284,800	103	46

N.B. QUALITY ASSUMED

[Percent contained Cr]

	Goal	Existing Stockpile
(1) FeCr (Hi-C)	65	59
(2) FeCr (Lo-C)	67	68
(3) FeCr (Si)	40	37
(4) FeCr (Chromite Grade)	33	33

[1] Not included in total to avoid double counting.

Chromium metal.—Although chromium metal accounts for only about 2 percent of chrome units consumed in the United States, its main application is in the production of super alloys, and wartime demand would be expected to surge well above current consumption levels. The U.S. does, however, have production capability for a little more than half of its annual requirements of chromium metal. The stockpile goal of 20,000 tons is, therefore, probably realistic, and our only recommendation would be to increase the current inventory to match the goals set.

Ferrochrome.—High carbon ferrochrome is undoubtedly the most important and widespread form in which chromium is consumed, and the stockpile goals need to be increased accordingly. Even if the excess holdings of low carbon ferrochrome were combined with the high carbon ferrochrome figures, the stockpile goals are clearly inadequate to supply U.S. industry in a wartime scenario. Stockpile managers have tacitly agreed with this point by holding current inventories well in excess of the established goals for ferrochromium.

The obvious recommendation, therefore, is to increase the ferrochrome goals substantially and add sufficient inventory to meet the revised goals.

The need to develop ferrochrome as the backbone of the chromium stockpile is further emphasized by recognition that the U.S. domestic ferrochrome industry has shrunk considerably in recent years, and all indications are that it will continue to decline further. Domestic ferrochrome processing capacity can supply about half of annual domestic needs at the present time. There are, however, few remaining domestic manufacturers of ferrochrome in operation, and furthermore, it is not clear how quickly the closed facilities could be reactivated in an emergency.

Chromite.—Chromite is by far the largest contributor (in terms of chrome units) to both the overall stockpile goal and total inventory actually held. Although chromite is unquestionably the most economic form in which to hold chrome units, we believe it is questionable whether sufficient U.S. processing capacity could produce adequate supplies of ferrochrome in an emergency.

We recommend serious consideration be given to reducing the chromite stockpile goals and upgrading the excess material held into high carbon ferrochrome.

Obviously, cost is a major consideration when the federal government considers increasing stockpile holdings. One possible cost-effective method of achieving increased chromium security is by government stimulation of private stockpiling. Government incentives could take the form of a tax reduction or an interest subsidy, with the government reserving the right to purchase or allocate supplies in an emergency.

COBALT

Attributes of heat and wear resistance high strength, and superior magnetic properties have made cobalt an important element in the manufacture of cutting tools, specialty steels, hard-facing materials, magnets and jet engine parts. Cobalt is also widely used as a pigment, as a dryer and in a variety of other chemical applications. The U.S. is virtually 100 percent dependent on foreign sources of supply. Zaire and Zambia produce over 60 percent of the free world's cobalt, while Canada and Australia represent important secondary sources. Cabot Corporation, through its High technology and Wear Technology Divisions, uses between 5–10 percent of U.S. consumption of this element. Cabot has been an important supplier of cobalt-based alloys for nearly 50 years.

In recent years, cobalt has become something of a symbol of our strategic dilemma. This is primarily due to our dependence for cobalt on two potentially unstable central African nations, underscored by the invasion of the cobalt-producing province of Zaire in 1978 by Katangan irregulars. The consequent disruption of supplies coincided with booming demand for cobalt (led by high-temperature super alloys for

jet engines[1] and resulted in a rapid five-fold increase in producer prices with even higher prices in merchant markets.

The stockpile is already adequate to meet a three-year wartime demand for cobalt in its more important applications. In a period of strong industrial demand and military buildup, it is unlikely that the annual demand for cobalt would exceed 15–17 million pounds. The stockpile currently holds about 40.8 million pounds, and the recently announced $78 million purchase of "high purity" cobalt from Zaire will add another 5.2 million pounds to the stockpile. It might well be argued, therefore, that current inventory levels are reasonable and the goal of 85 million pounds could be substantially reduced without any erosion of national security. This point is particularly relevant in light of recent changes in demand patterns in direct response to high prices and fear of supply disruptions.

Cobalt demand has decreased, partly because of continuing substitution for cobalt of less expensive materials which possess better prospects for long-term reliability of supply. Significantly reduced markets include tool steels, hard-facing materials, magnets and a number of wear-resistant alloys. There has also been significant progress made in reducing the use of cobalt in high-temperature super alloys in jet engines. For example, several nickel-based alloys containing cobalt have been traditionally used in the manufacture of turbine engine discs. Engine designers are gradually changing the disc alloy. This single substitution at Pratt and Whitney Aircraft alone will reduce cobalt usage by about 600,000 pounds per year.

The prognosis for cobalt, therefore, is one of declining strategic importance and only slow growth in demand.

Contrary to frequent allegations, we do not consider that the material in the stockpile is of such poor quality that it cannot be readily used. Although the material does contain certain impurities, current melting techniques used by most super alloy manufacturers would generally produce a refined product. A good proportion of the stockpiled cobalt probably could be used in the production of super alloy products. A greater certainty will arise after the assay program recommended earlier. However, it is reasonable to expect that all the stockpiled material is usable in industrial applications.

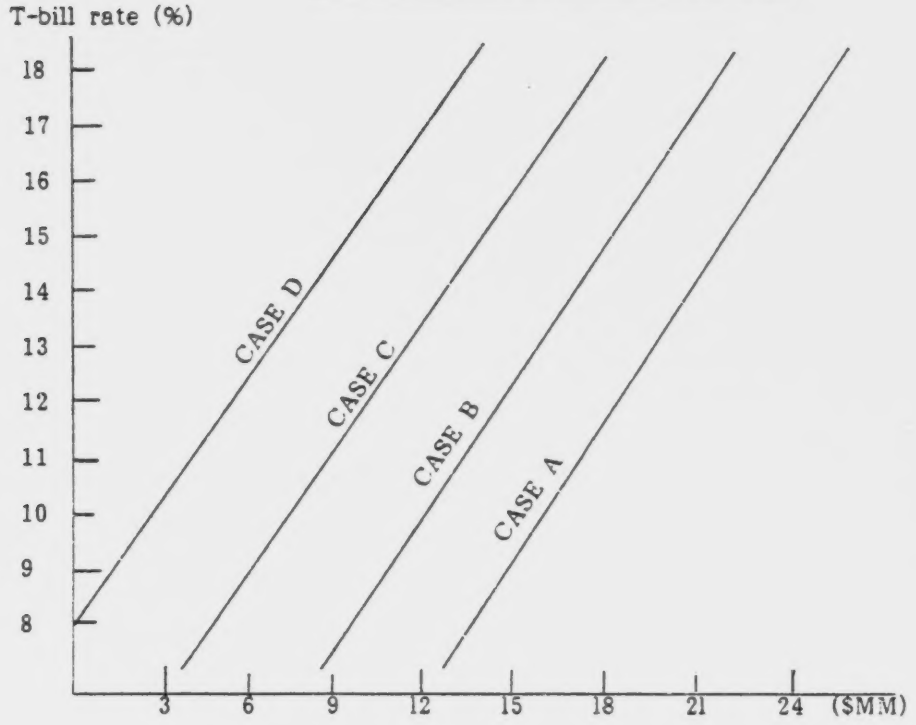
Finally, it is important to note that the U.S. does possess significant indigenous cobalt deposits which, if developed, could greatly reduce this country's dependence on central African sources.

The price of cobalt is currently depressed and production from the Blackbird Mine in Idaho is not economically feasible at current prices of about $10–$12 per pound. Proponents claim that production will be economic at $15 per pound or slightly higher. Title III of the DPA has been cited as a mechanism by which this deposit could be produced. As noted earlier, reduced financing costs of carrying excess inventory could cover a significant subsidy to an operation like the Blackbird Mine.

As one approach, the government could offer the minimum of a floor price or subsidy per pound of production. If the market price were above the floor price, clearly no call on government security could be made. If the market price dropped, the company would have the option of a subsidy of up to, say, $3 per pound, an arbitrary figure which represents the difference beween the projected long-term price of cobalt, $12, and the price at which mine production becomes economic, say, $15. If the market price dropped below the $3 subsidy level the company would assume all the risk. Conversely, if the price of cobalt rose above $15, the company would retain the benefit.

The maximum level of support—the subsidy—could be set so as to be less than the expected carrying cost of material in the stockpile. As can be seen from the chart below, at current financing costs (about 15 percent), over $5 per pound in support could be paid before the subsidy exceeds the savings from reducing the stockpile inventory.

POTENTIAL ANNUAL GOVERNMENT SAVINGS
WITH BLACKBIRD MINE OPERATION



ASSUMPTIONS

Blackbird mine produces 4MM pounds of cobalt per year. This allows the stockpile to be reduced by 12MM pounds.

The 12MM pounds of excess inventory at $12 per pound has a total value of $144MM.

Government will subsidize Blackbird as follows:

Case	Co market price	Subsidy per pound	Total subsidy paid annually (dollars in millions)	Projected savings at various interest rates			
				10 percent	12 percent	14 percent	16 percent
A	$15 or above	0	0	14	17	20	23
B	$14	1	$4	10	13	16	19
C	$13	2	[illegible]	6	9	12	15
D	$12 or less	3	12	2	5	8	11

Annual savings achieved (interest on $144MM stockpile reduction less subsidy paid) will, of course, depend on the interest rates in effect.

COLUMBIUM

Columbium is used chiefly as an alloy with steel. Principal uses include pipeline steels for transporting oil and gas and structural steels. Columbium also is used in the production of super alloys for the aerospace industry. Aerospace applications

comprise approximately 10 percent of current annual consumption. Columbium is produced primarily from the mineral pyrochlore and is mined primarily in Brazil. Some natural columbite (columbium ore) is mined in Nigeria and elsewhere. Columbium is also found in conjunction with tantalum ores in Brazil and Australia.

Although Cabot believes that the stockpile goal is too high when compared to actual expected demand, it still falls short of stockpile objectives with inventory at approximately 15 percent of stated goals. The government's plan to supplement current inventories with additional purchases of tantalum concentrates or tantalum-bearing tin slags, with which columbium is commonly found, should be a good way to contribute to the columbium stockpile needs.

Nevertheless, a major effort should be made to develop realistic stockpile goals that would allow for continuous production in the event of an emergency—that is, the leadtime required to draw raw material through the manufacturing process. Most of the material should ideally be held as ferrocolumbium because of the large steel industry requirements, with some quantities of columbium metal for the super alloy industry. Currently, there is no stockpile goal for columbium metal.

TANTALUM

Tantalum has unique electrical and physical properties which make it ideal in electronic components and super alloys primarily for the aerospace industry. Approximately 73 percent of the tantalum supplied by the Tantalum Producers Association (TPA) in 1980 was used in the electronics industry, mainly in the manufacture of capacitors; approximately 10 percent of the electronics demand is considered military-related. Another 6 percent of the total demand was used for the aerospace industry, some 25 percent of which was military-related. Total military demand, then, is 9 to 10 percent.

Tantalum, which is produced from tantalite ores mined principally in Canada, Brazil, Australia and Africa, is also extracted from tin slags produced in Thailand and Malaysia. Tantalum-bearing raw materials have never been economically produced in the United States.

The current tantalum stockpile inventory is approximately 33 percent of the objective without regard to specifications. It is our belief that all three of the domestic tantalum processors could process the existing inventory in an emergency. But we believe the goal is too high based on relatively flat annual demand projections of 1.5 million pounds of Ta equivalent in a good year (1980—TPA data)—current production is approximately 900,000 pounds. The goal also appears to ignore production of approximately 250,000 pounds of Ta_2O_5 (equivalent) per year from the Tanco mine in Canada (Cabot owns a 37.5 percent interest in the Tanco mine). In addition, the goals should be reviewed to reflect the need for continuous production (i.e., the time it takes to process tantalite or tin slags into metal, etc.), which means end product goals should be reviewed to reflect capacity limitations and tantalum powder efficiency.

As indicated in the table below, the federal government need not endeavor to increase its tantalum raw material holdings by more than 3.1 million pounds, given the limitations of domestic processing. However, because of expected continued flat demand, and additional security protection of one million pounds of tantalum might be sufficient. Again, private stockpiles are an attractive, cost-effective alternative to additional stockpile purchases. The table below outlines an approach to the tantalum security problem.

CURRENT STOCKPILE STATUS

[Tantalum in thousands of pounds]

Commodity	Goal	Inventory
Tantalum powder	0	27
Tantalum metal	0	201
Tantalum-bearing minerals	8,400	2,551
Total		2,779

TANTALUM PRODUCT REQUIREMENTS

[Millions of pounds]

[Figures account for processing losses and expected yields]

	Industry	Capacity
Total annual U.S. demand	1.8	2.2
Demand in Ta equivalent	1.5	2.2
Projected in 3-year goals	4.5	6.6
(Minus) stockpile inventory	(2.8)	(2.8)
(Minus) Tanco Canadian production	(.7)	(.7)
Security purchase requirements	1.0	3.1

Clearly, it is in the government's best economic interests to hold the stockpile materials in the least-expensive form, commensurate with industry's ability to process the products. Therefore, an additional purchase of tantalum raw material should include the production from mines such as Tanco in Canada and Greenbushes in Australia, upon which 80 percent of the world's mined tantalum production depends.

TITANIUM

Contrary to common perceptions, titanium is an abundant material. It is the ninth most common element in the earth's crust and found in a number of different geographic locations. Titanium is about 60 times more abundant than chromium and 250 times more so than cobalt. The two most common minerals containing titanium are ilmenite and rutile. Rutile is the preferred starting material for the production of titanium metal. At present, Australia is the main and most economic source of this material. South Africa and Sierra Leone are becoming secondary sources. However, small deposits exist in the Western hemisphere and in the U.S. In addition, ilmenite, which is more difficult to process but could be used for titanium metal production by producing synthetic rutile, is an even more abundant mineral. The United States has significant deposits of ilmenite.

Last year the U.S. consumed about 25 percent of the world's production of titanium ore. However, only a very small share of that consumption, about 5 percent, was used in the production of metal. The bulk of titanium use is in the form of titanium oxide in pigments for paints, paper and plastics.

Titanium metal is an important structural material for modern aircraft and industry. It offers a unique combination of high strength, light weight and corrosion resistance. Following the 1980–81 supply shortage and price increases, concern in the U.S. defense establishment has centered on domestic titanium sponge capacity, the intermediate step in the production of titanium metal.

As the table below indicates, the U.S. is now virtually self-sufficient in sponge capacity and that production is increasing. Accordingly, we believe the stockpile goals are too high and could appropriately be revised downward. Perhaps a prudent approach would be to increase the rutile goal to accommodate a three-year wartime demand, purchase additional rutile to meet that goal, and reduce the sponge goal to the present inventory level which is sufficient to meet a surge in demand that could arise from wartime conditions.

TITANIUM DATA FOR METALLURGICAL USE

[Tons]

	U.S. consumption	U.S. production (capacity)	Stockpile goal	Stockpile inventory
Sponge (tons)	26,900	26,500	195,000	32,331
Rutile (tons)	50,000	15,000–25,000	106,000	39,186

Senator SCHMITT. Thank you, Mr. Manly.

What do we do about situations where stockpiled material is still in the form of a mine and then because of market conditions, those

mines are shut down and become less accessible? This is the situation with copper right now.

Mr. MANLY. I am not an expert on title III, but it is my understanding that you can guarantee a price for raw material to the producer. If you do that, you could have support for that particular mine in the case of cobalt. There is a certain figure at which that mine could produce cobalt efficiently and be profitable.

Senator SCHMITT. Thank you, sir. We will get some more questions in a moment.

Maxie, would you proceed, please.

Mr. ANDERSON. Mr. Chairman, it is nice to be here. Of course I guess when you do what I do it is sort of nice to be anywhere.

I would like to first speak to the strategic stockpile to say that I completely endorse it for our defense. I think it goes just beyond the normal question of defense. I think it is a matter of national determination to defend ourselves and I think other people must see it the same way. I would hope the Russians would.

I would like to support S. 1982 of which you are the author, and I would like to tell you two quick stories as to why I do that.

The misuse of the stockpile has been phenomenal over time, but certainly understandable politically. I will work on both sides of the aisle in a matter of fairness. We should return to 1967. We had the longest strike in the copper history which lasted for 13 months. We were at war. This was 1967, Vietnam. It is interesting that the President, Lyndon Johnson did not invoke the Taft Hartley Act and you may be interested as to the reason why.

George Meany heading the AFL-CIO and the steelworkers had asked the President not to and to take the copper out of the stockpile. At that time we had over a 1,400,000 tons in the stockpile. We today have zero. The reason was that the steelworkers wanted to organize the copper industry so that all the contracts expired at the same time. That was done and that does exist today. That is for nationwide bargaining.

Now to switch on the other side of the aisle. Let's come forward to last year and the silver policy. Our Budget Director, Mr. Stockman, appeared before the Armed Services Committee, I am told, and when it was pointed out that the committee did not desire to sell the silver in the stockpile because we were down to 137 million ounces, his reply was that the administration would only support the increase in military pay if that was done because his job was to balance the budget.

Now I don't think we should condemn these men. Politics are what this country lives with and does pretty well. But I think that it makes no sense for a strategic stockpile to be subject to that sort of pressure. I completely endorse the removal of the stockpile and being put under a Federal Reserve Board sort of administration.

I also agree with Mr. Strauss that in a time of war there can be no question that the President can call up any minerals that are in it.

I would like to move on to one other thing. First, I would like to comment on cobalt. Up to the year 1979 the U.S. Government was selling cobalt. It wasn't buying cobalt. Therefore, another reason for the stockpile build and S. 1982.

I would like to move on to the silver policy and maybe I won't have to spend quite so much time if Senator McClure has accomplished the mission. If I go back to 1941, and I have here a report written by Handy and Harmon, their 26th Annual Report of the Silver Stockpile. They pointed out that the United States in 1941 at the close of the year, we had been at war if you recall then 24 days, had 3.29 billion ounces of silver. That is a heck of a lot of silver: Today we have less than 5 percent of that amount. We have 137 million ounces and it was proposed that it be sold. I think that is absolutely wrong.

There are two things wrong with it.

First, we use during time of war about that amount each year, 140 million ounces. The United States itself produces 40 million ounces. So we only produce one-third each year of what we require in wartime.

Second, and I think more importantly, it is not a question of could we get the silver elsewhere because I don't know what we would buy it with. Most of us don't recall, but going into World War II we not only had over 3 billion ounces of silver, but all of our currency was backed by gold. Today less than 10 percent of it is, and I don't know what we would trade for war materiel. We will go on a barter system. Nobody will take your paper money. It would be redundant to point out that nobody would like to have a Reich mark or Confederate money. The fact is what would we do with Russian rubels? Unless you could freely convert the currency you don't want it.

And I am afraid the United States must look realistically at that same problem, that if war comes again that we are going to have a hard time buying things because of our currency. I suggest, therefore, that our silver policy is absolutely wrong. It is not a question of sale, it is really a question of purchase, because in time of war we need something to barter that we can send by air.

I guess lastly I would deal with this question of economics. First, as it has been pointed out, half of the U.S. copper mines are down now. We are the largest copper producing country in the world. We produce 1.4 million tons. By the time this next week is out 700,000 tons of the copper industry will be down. That automatically means one-fourth of our silver will not be produced because it is a by-product of copper. It also means that about half of our gold won't be produced because it is mainly a by-product of copper operations.

I would say that realistically——

Senator SCHMITT. Do you have the percentage of molybdenum that is lost?

Mr. ANDERSON. No, sir, I do not.

I debated in college and this is some 25 years ago the U.S. policy on free trade, and I think I left college thinking that the best thing for the United States was free trade. I think 25 years later as I look at my country's economic condition and look at it not just this year, which is exaggerated, but if I look back to 1972 forward, the U.S. economy has not grown, or very minor. We have lost a big part of our automobile assembly operations, and of course when we do that we lose our ability to make tanks and trucks or war mate-

riel. We have lost a sizeable amount of the increase of our raw materials, as you quoted earlier when we started.

I think that as a country we ought to take a little time and relook at the question of absolute free trade because, as Simon pointed out, it is not necessarily free both ways. While we are losing half of our copper industry in the first 6 months of this year, Chile increased its copper production by 7 percent. Not only that, but all the small mines, the smelting was done free to keep them on line. Now they intend to make it up when the price goes up. But it is obviously a subsidy.

I must point out that that is all at the expense of these United States, and that in time of war when our sealanes are closed, as they will be, that our ability to defend ourselves, which war is a terribly wasteful thing, with raw materials and with machines of war which we will need in great abundance, we will be severely hampered.

So I would like to first say that I completely support S. 1982, that, second, our silver policy really should be toward the acquisition of silver and gold so that our currency has all the strength that we can have going into a war and, third, that our concept of free trade may in this year of 1982 need to be taken another close look at if we are to preserve the ability to defend ourselves and indeed our economic health.

[The statement follows:]

STATEMENT OF MAXIE L. ANDERSON, CHAIRMAN OF THE BOARD, RANCHERS EXPLORATION AND DEVELOPMENT CORP.

Mr. Chairman, distinguished committee members and visitors: I am pleased to appear before this Committee and present to you certain of my views concerning the materials and minerals policy of this nation. I shall also be pleased to answer any questions you may have concerning my remarks, which some of you may find a bit unconventional. I am convinced, however, that our country may despearately need a little less conventional thinking, and I believe my theories are sound based upon history and fact.

I should first like to endorse the President's National Materials and Minerals Program Plan, although for your consideration I should like to make a few observations and suggestions that may be appropriate. The question of land availability has been raised and it is very germane to your task. Obviously, mineral deposits will not be discovered unless you are exploring for them and, in view of their scarcity and the very small surface area which they represent, one must explore and evaluate thousands of potential deposits in order to develop only a few commercially minable reserves. As far as the wilderness areas are concerned, there are few people who have spent more time in the outdoors than I have. I love the wild rivers, enjoy our scenic areas of the West and I can understand the wilderness desire. However, I beleive it is meaningless to place any reliance on wilderness areas for production of strategic metals during a period of national emergency. Without prospecting and exploration, it would be next to impossible to identify minable resources which could be developed and operated for production of wartime materials. Even if exploration were to begin today, it would probably be a least seven years before we could expect to bring an operation on line for production of strategic minerals. Accordingly, it should be clear that unless there is a change in our policy with respect to existing wilderness areas, they will afford little comfort in terms of production of strategic minerals.

The Present policy towards existing wilderness area may be politically wise. It is, however, strategically unwise and you, the Congress, must reconcile the two divergent philosophies.

I am also compelled to suggest a change in our policy with respect to the withdrawal of lands from mineral entry in order that they may be studied for possible designation as wilderness areas. Our present policy or direction is that lands are withdrawn under the concept that following study for some predetermined period of time some or all may be restored to the public domain for multiple use. I believe

this is wrong and I would suggest to you a somewhat radical departure from this policy, both as to lands presently designated as wilderness and lands now being studied. I would suggest a law which would return all public lands to multiple use, with provision for government withdrawal in the event that a specific need for a specific acreage within a specific time period can be reasonably demonstrated. We would then be assured that withdrawals would be selectively and necessarily made, perhaps once a year, and that the burden of demonstating that lands should be removed from multiple use in the public domain would rest with the government (which now acts as prosecuter, judge and jury) and not upon individuals within the private sector.

I should now like to address the question of our strategic stockpile and its role in our National Materials and Minerals Program. I heartily endorse the Administration's statement of policy regarding our National Materials Minerals Program. Without getting into too much detail, however, there are four specific points which may not be implicit in our present policy and which must in my view be recognized if our strategic stockpile goals are to be realistic. Ironically, these points would also seem to have a rather direct bearing on the economic difficulties currently being encountered in our domestic economy. These essential points may be summarized as follows:

(1) Our industrial base must remain strong if (i) our strategic stockpile requirements are reasonable assessments of our true needs and (ii) we are to be able to make proper use of our stockpiled materials in the event a need arises.

(2) The requirements of our strategic stockpile must be removed from the political arena along the lines proposed by Senator Schmitt in Senate Bill 1982 introduced in December, 1981.

(3) A well conceived and administered stockpile program will create demand in certain sectors of the economy, thereby strengthening the industrial base to which I have previously referred.

(4) The policy of selling silver from our stockpile is fundamentally wrong in that it weakens our currency and severely diminishes our ability to purchase or barter during times of national emergency in which traditional rules of "free trade" may be totally inapplicable.

Before proceeding to comment on each of these individual items, I should like to offer an overall perception of the stockpile and the priority which it must receive if our goals are to be achieved. If the stockpile is representative of our ability to defend ourselves and survive during times of national emergency, in my view it must receive top priority. It will be representative to some degree of our national determination to remain a free people and will therefore affect our ability to interact both politically and economically on an international scale. With this in mind, I should like to proceed to comment on the four points I have enumerated above.

With respect to our industrial base, it is well understood that such a base is an essential ingredient for our national defense. For example, Admiral Yamamoto observed in World War II that a quick and decisive action was essential for Japan's success because that country could not stand up against our industrial base in a prolonged war. It must be equally understood, however, that raw materials, either produced or stockpiled, must be available to generate the required end products. For example, it is recognized that when an automobile plant is closed we have equally reduced our capability to produce needed jeeps, trucks or tanks. We have just as effectively reduced our capacity to produce such needed items when a mine, smelter or refinery is closed because of economic conditions, including most notably market prices for metals. Equally as important, when our domestic productive capacity is lost through such closures, we become vulnerable to greater dependence upon foreign supplies which may not be available during times of national emergency during which the rules of free trade do not apply. While the stockpile is designed to some degree against this latter risk, it cannot totally do so if our industrial base is allowed to weaken in the meantime. Accordingly, strengthening our industrial base is essential if our stockpile goals are to be achieved, even if we must implement foreign quotas or tariffs to restrict the loss of American markets. To make this point a little more forcefully, I would point out to you that approximately 50% of our domestic copper production capacity has been shutdown by depressed copper prices while at the same time Chile has increased its copper production by about 7 percent during the last five months. As you know, copper is one of the major items in which our stockpile is severely deficient.

As I noted above, I also believe strongly that the stockpile and its administration should be removed from the political arena. Senator Schmitt shares my objective and I heartily support his efforts with respect to Senate Bill 1982. The reason for my thinking relates primarily to the priority which I believe the stockpile must be

given. It is, in a sense, a flag ship of our defense determination and must not be used as a budgetary tool subject to the whims of a particular administration. Similarly, it must never be utilized to disrupt markets when stockpile goals are exceeded, particularly if political considerations are involved. To the contrary, intelligent stockpile planning can stabilize or firm certain weak markets in materials that are critical to maintenance of a strong industrial base.

My next point is not totally unrelated to the previous two, in that building the stockpile, absent political considerations, can create demand and provide needed help to our industrial base. In this regard, I am sure that you all are painfully aware that lack of industrial demand for primary raw materials has been a major factor in our current economic recession. Reflecting upon my belief that our stockpile requirements must receive a top priority, it would seem to follow that immediate action to begin building the stockpile would also provide a much needed boost to our basic raw material industry and the overall economy. I do not see this as a political reason relating to the stockpile in that it is totally consistent with our goals and objectives. To the contrary, one could view it as an undoing of prior political actions which have effectively served to decrease the competitive ability of our raw materials industry in an international market. I also think it is clear that an economy cannot retain its complete industrial strength based upon consumer spending, particularly if the consumer tends to spend more for services, repairs and maintenance as opposed to spending in a manner that creates demand for industrial raw materials. Needless to say, the demand created by stockpile acquisitions should be filled from domestic sources.

The final point I should like to make relates to what may seem to be directed towards a singular item within the stockpile planning. That item is the proposed sale of silver from the stockpile which I have studied in considerable detail as a result of my company being a major silver producer. Notwithstanding the fact that actual and proposed government sales of silver triggered a decline in prices that has already closed down more than 30% of domestic silver production, I do not believe the policy of further silver sales is a question of "Who's ox is getting gored?" To the contrary, I believe a reflection upon historical events should convince one that our policy should be to increase dramatically the quantity of silver held in the stockpile.

At the beginning of World War II, the United States owned nearly 3.3 billion ounces of silver and also had fully convertible currency. We now have approximately 137 million ounces of silver in stockpile, which is destined for disposal based upon current policy. As I understand it, the reason for disposal is that even though we only produce 40 million ounces per year and consume 130 million ounces per year, the difference can be made up with purchases from Canada, Mexico and Peru. The problem with that type of thinking is that it presumes we will have something with which to purchase the silver. In other words, our U.S. dollars may be worthless in times of national emergency because the rules of free trade do not apply and a prospective seller may legitimately feel that the dollars he would receive would effectively have no purchasing power. This would be particularly true in the event a seller was concerned as to what country would ultimately prevail in a prolonged conflict. As an example, the English borrowed some 300 million ounces of silver from the United States during World War II to pay their colonial troops who would not accept paper currency. In other words, paper currency may become worthless in times of crisis and we may effectively be reduced to exchange or barter to obtain needed resources, particularly if there is nothing behind our paper currency. Accordingly, I have come to the conclusion that is is absolute folly to sell silver from the stockpile and I would strongly urge you to take whatever action may be necessary to prevent further sales. Further, I believe that logic compels a very strong argument that our policy should be entirely the opposite and that our efforts should be directed towards acquisition of additional silver in substantial amounts for the stockpile. Not only would doing so provide an injection of capital into the economy, but it would do so in a manner whereby the government would be acquiring a hard commodity in exchange for its money, thereby maintaining the value of our currency. The added benefit of helping the industrial base would also be achieved in that a substantial portion of domestic U.S. silver comes as a by-product of copper, lead and zinc operations, which are severely depressed at the moment.

I appreciate the opportunity to appear before this Committee and offer what I hope you will find to be well reasoned comments concerning our national defense stockpile and its interrelation with our domestic economy, which I desperately believe is in need of strengthening. I would also hope that none of us is constrained to seek only conventional solutions to what are extremely serious and unconventional problems. Thank you.

Senator SCHMITT. Thank you, Maxie.

I appreciate you being here representing, as I do, a State with not only current mining activities but significant potential for the future if we ever do get a realistic minerals policy, especially for manganese, columbium, tantalum and maybe tin in addition to the copper and molybdenum and other obviously strategic materials. We have a very parochial interest, but I think it is an interest to the United States in reality.

Mr. Strauss, you said you knew the——

Mr. STRAUSS. Yes; about a third.

Senator SCHMITT. A third of the moly production is by-product?

Mr. STRAUSS. Yes; and two-thirds comes from moly mines.

Senator SCHMITT. So looking at copper as an example, Maxie, have you tried to make any estimate of the rate at which the industry in its current situation could rebound in response either to an economic upturn or to obviously increasing defense needs even without a war situation developing?

Mr. ANDERSON. Well, an estimate, sir, is not of encouragement. I think that what has happened in the mines is that we have put many environmental programs in and we have increased our cost as primary producers. In time of economic turndown we are the first to come off line because we are the highest cost producer. That is the inevitable part of life in our business, as you know.

I think that this is probably exactly the right time for the United States to be buying copper. The one great advantage of——

Senator SCHMITT. For the stockpile you are referring to?

Mr. ANDERSON. Yes, sir, for the stockpile. We are supposed to have a million tons. We have zero. The reason is very simple. The one advantage of high-cost money is that it is very depressing on commodity prices. So you get the greatest bargain in the world, the country does. I would not buy it abroad, or if I did I would buy it at restricted low prices.

I think that it is a foolish policy if we are trying to help ourselves that we do it as intelligently as we can. Going into 1941 into World War II we paid the U.S. silver producers 71 cents an ounce and we paid foreign producers 35 cents an ounce. Now they didn't have to take it unless they wanted it, but that is the way we did it. I guess, like you say, we are a little parochial in our part of the world, but that seems to make sense to me.

Senator SCHMITT. Isn't it true that with an economic upturn or increasing defense needs for copper, and possibly for other materials, the new demand is going to be met by imports and not by domestic production?

Mr. ANDERSON. Well, sir, I don't think we have lost those mines yet. In time if they stay down for another year some of them will never reopen of course.

Senator SCHMITT. As it stands today can they reopen fast enough to meet the demand of a modest economic upturn? Let's say we go to a 3.5 percent growth in the GNP, which is the average roughly since World War II.

Mr. ANDERSON. I think Simon may be able to answer better. The price today as I came over here was around 54 cents. Probably the minimum price to produce copper in the southwestern part of the

United States is around 85 cents. So the price has to make a material recovery or you will never get those mines on line.

Senator SCHMITT. That is the minimum price to operate a mine. It is not necessarily the minimum price at which you stay active very long.

Mr. ANDERSON. No; that is so because you can't replace anything at that price and you can't start a new mine at that price. That is more like $1.50 or $1.35 or something of the sort. There is a 3-month lag in the pipeline. In other words, from the time a mine shuts down until all the copper is out of there and it comes out the other end of a smelter and refining process it is 3 months. So on an upturn there is a minimum lag of 3 months as well.

Senator SCHMITT. Mr. Strauss.

Mr. STRAUSS. I would like to repond further to your question because the mines that are continuing to operate are doing so by mining the most readily accessible ore. Most of our copper now comes from open pit mines. What companies are doing is mining those sections of the ore body which require the minimum amount of stripping.

When we get an improvement in conditions, which we hope will come about soon, most of the companies are going to have to increase their stripping ratio to get access to the normal grade of ore. So that it is going to be a long time and some of the mines that are still operating, and I am thinking particularly of the mines in Montana, seem to be operating in such a way that they are really preparing to salvage them. They are taking out what is readily available and the balance of the deposit may be lost.

One factor which we haven't really dwelt on today, which I think is terribly significant from a strategic standpoint is that the loss of domestic processing capacity means that an increasing share of domestic mine production of copper is going abroad to be processed in Germany and in Japan primarily but also in some other countries.

That copper will be subject to double hazard in the event of a military event if we do not have the processing capacity at home.

Senator SCHMITT. You anticipated my next question. Is it correct that Anaconda now has no smelting operations in the United States?

Mr. STRAUSS. That is correct. Tney shut down their operations in 1980 and they made a contract to have all their material treated in Japan. Since then they have shut down one of their three mining operations. The two remaining ones are exporting their production.

Senator SCHMITT. What proportion of U.S. domestic concentrates are now shipped abroad for refining?

Mr. STRAUSS. It is about 10 percent of the copper contained in the copper currently being produced.

Senator SCHMITT. What is the rate of change?

Mr. STRAUSS. Well, the rate of change is from zero. I mean we used to smelt all our material.

Senator SCHMITT. Zero since when?

Mr. STRAUSS. Since 1980. There were occasional exports of concentrates prior to that.

Senator SCHMITT. Is it safe to say that there is a trend of about 5 percent per year?

Mr. STRAUSS. It is safe to say that if the environmental regulations are not modified or if capital expenditures are not made by the companies, which unfortunately do not have the capital resources today that they had a few years ago, that there will be further smelter closures and a further increase. I would hesitate to project an exact 5 percent per year. But conceivably 4, 5, or 6 years down the road if changes are not made in this situation we may see a third or 40 percent of all copper mined in the United States being processed outside the United States.

Senator SCHMITT. This loss of refinery capacity in the United States or the nonexistence of it is not just isolated to copper. Doesn't it also exist in aluminum, which we take very much for granted?

Mr. STRAUSS. It exists in aluminum. It exists in an exaggerated form in the case of zinc where out of 14 zinc smelters operating in 1970 we now have 4 still running in this country. It exists in lead where we have had three smelter closures and it exists also in the ferroalloys, ferrochrome and ferromanganese.

Admiral Mott made a reference to that, and it is one of the most severe problems. We have got a stockpile of manganese ore, but if we don't have capacity to convert that to ferromanganese, it doesn't do us much good because we can't make a ton of steel without ferromanganese.

Senator SCHMITT. How long would it take us to develop that capacity, Admiral Mott, do you know?

Admiral MOTT. Well, this question is fundamental to the whole issue of the condition of the mining industry in the United States. There is, sir, a French expression that pretty well describes what has been heard here today. It goes: "Plus ca change, plus c'est la meme chose,"—or the more things change, the more they remain the same.

There was a committee in this Senate which prepared a report during the years of the Eisenhower administration that really is a specific answer to the question you asked both Mr. Manly and Mr. Anderson and that was Senator Malone's report. There is just one very short paragraph that I would like to read from it which tells you what happens when mines are closed down.

> Mines once closed down require years of time and tremendous investments to reopen. With experienced workers and technical staffs widely scattered, machinery liquidated, mines flooded and caved, much of our once available reserves are destroyed and prospecting for new reserves is discouraged. Failure to realize the situation could mean tragedy to our economy and our material security.

You see, this situation also puts the lid on prospecting. I have asked representatives of the mining industry how much of the 40,000 acres that the Senate has set aside from the wilderness in Idaho has been developed—the answer was more. I have also asked if they had been there to do any prospecting and the answer was, quite simply: very little. What is the point of going in and spending a lot of money prospecting for cobalt, which the mining industry is pretty sure is there—and they have done some ground work and exploration—when it couldn't possibly be mined even if it were found unless there is some way that the Government could subsidize it to a certain extent. How much money would you need, I asked, to do it? The response was that the cobalt had been bought

at $15 a pound from Zaire and it could probably be mined at a profit for $20 a pound in the United States.

So somebody has to make up the differential or the marketplace solution is just not going to work, as Mr. Anderson indicated. No private corporation is going to go in and mine something at a loss to its stockholders. That just won't happen. So therefore when you talk about—in the words of the President's report—"new mineral deposits * * * not [being] found unless the private sector looks for them," I remind you that the private sector is not going to look for those mineral deposits unless somewhere down the road there is a prospect of mining them at a profit.

Senator SCHMITT. To what degree does the U.S. mining industry face unfair foreign competition because of trade agreements?

Mr. STRAUSS. Well, I wouldn't want to say it is the trade agreements. It is rather the internal policies which are adopted by various countries to assist their home industries and I will give you two or three examples of the kind of thing I am talking about.

The Japanese are as heavily dependent as we are on imports of certain materials and in some cases more dependent. They don't import metal. They import ore and process it themselves because they have a system. It is not a formal system of quotas. It is not even a system of tariffs, although there are some tariffs. What it is is an implicit agreement between the Japanese Government through the Ministry of International Trade and Industry, on the one hand, the Japanese banks and the Japanese mining companies and the Japanese trading companies, that they are going to import ore and they are not going to import metal.

Once a year they sit down and they figure out what their consumption is likely to be and they decide, for example, that they will need, say 1,300,000 tons of copper and that their domestic smelters and refineries can get enough ore to produce a million tons of copper. So they will only import 300,000 tons. There is no formal quota. But by some magic, because of the difference in the antitrust laws and the whole social structure only 300,000 tons gets imported into Japan. And I don't care how hard you try to sell an additional pound of copper in Japan, you are not going to sell it.

Senator SCHMITT. I have a letter which I will include in the record by reference, from Ambassador Brock in response to my letter to the President relative to imports of uranium at a time when the domestic uranium industry is of course in a severely depressed condition. Uranium doesn't normally appear on the list of strategic materials as we have been talking about it, but I think we would all agree that it is a strategic material for more than one reason.

But basically his point was that even if they could agree that we should limit imports of uranium in order to encourage the domestic industry, that they would in turn have to be subject to GATT and possibly payments to other nations who could claim to have been hurt by this action by the United States. Do you agree with that assessment by the Ambassador?

Mr. STRAUSS. I do agree because the United States is the target. When there have been discussions about measures within the United States and other metals with which I am more familiar than uranium—copper, lead, or zinc—about some steps to restrain

imports into this country, there is an immediate protest and an outcry because we are the big boys. I have never heard the Governments of Australia, Canada, Peru, or Mexico take issue with the Japanese Government about the policy I just described. And yet Canada, Australia, Mexico, and Peru are constantly saying they don't want to export raw materials but they want to export finished metals.

So they complain about the U.S. policies that they think inhibit their difficulties, but they remain silent when it comes to the Japanese practices.

Senator SCHMITT. To what degree does the United States directly or indirectly subsidize foreign mining operations in addition to what I just described?

Mr. STRAUSS. Well, within just the last few months financial assistance has been made available to copper producers in Zaire, Zambia, and Peru by either the Export-Import Bank, the World Bank, in which we take part, or the Monetary Fund to assist them in meeting their financial conditions. There is no governmental institution to which a U.S. copper producer having a financial problem in taking care of his problems can go. He can go to private banks, but the Government has no program to assist the domestic producers.

Admiral MOTT. Well, the U.S. mining industry would be financed if title III of the Defense Production Act was invoked. We have that statute on the books in this country.

Senator SCHMITT. But there is no international mechanism?

Admiral MOTT. No.

Senator SCHMITT. Do you gentlemen feel there should be a priority to the items purchased for the stockpile, assuming we could convince somebody that they ought to be purchased, or should we just try to generally meet our goals?

Admiral MOTT. That is where the management system that we have all endorsed comes in. If you had proper management to set those priorities, then I would say yes. But we don't have that today, and until a bill like yours is put into law and knowledgeable people are gathered together to assess those priorities and make independent judgments with respect to the priorties, I don't believe it can be done.

What do you think, Simon?

Mr. STRAUSS. The reason that the American Mining Congress supports the principle of floor price guarantees is that it assures a minimum price to ensure domestic production. At times that price may be above the world price level and in today's depressed conditions it is, but at other times that floor price guarantee will be far below the world price level because these are extremely volatile markets. Admiral Mott mentioned $20 a pound for domestic cobalt, and it is above today's market for cobalt. But 3 years ago when the Province of Shaba was invaded, the cobalt market was $40 to $50 a pound.

Now during the Korean War the principle of the floor price guarantee was used to expand domestic production of copper, aluminum, nickel, and a number of other commodities. I happen to know is the case of our own company, ASARCO, that we wrote a contract with the Government under which we were guaranteed a mini-

mum price of 24 cents a pound for copper to come from a new mine project, the Silver Bell Project in Arizona. That contract was written in 1951. Silver Bell started producing copper in 1954. It stopped producing copper late in 1981 because of the collapse in the market. Not 1 pound of copper was ever delivered to the Government and not 1 cent of taxpayer money ever actually went for this. But it was simply the assurance of a price which was a reasonable price in terms of the estimated cost of production that made the company decide to proceed with that investment.

That is the principle that is involved here. We are talking about a moving target when we are talking about the actual prices in the world marketplaces. To describe a floor price guarantee as a subsidy is a misnomer because while it may provide an advantage at one time, at other times it will not. Under the floor price guarantee system the Government only takes the material when there is not a ready market in the private marketplace.

Senator SCHMITT. To what degree does that tend to stabilize world prices as well?

Mr. ANDERSON. It tends to put a floor under them. I think there is another thing. I think we ought to be aggressive buyers right now. I think we would inject money into the system without inflating it. And, you know, if we don't do that pretty soon, in other words, even though we are on the supply side economic theory and probably one that will work in due course, we are going to have to have some demand to get that supply side to work. I think a very intelligent and a very meaningful way to do that is now to aggressively buy for the stockpile almost any sort of commodity.

Senator SCHMITT. Mr. Manly, you suggested a cooperative industry/Government arrangement for assaying the stockpile. Do you have any elaboration on that?

Mr. MANLY. Well, take the case of tantalum. There are three domestic producers and there is also a Tantalum Producers Association that meets every so often. From the standpoint of the difficulties of getting good analytical results and the fact that these people do have round-robin analytical capabilities, it would seem to me that the tantalum producers could look at this and do it through their association. The same way with the Ferro-Alloys Association.

Senator SCHMITT. Is it your impression that they would be willing to step forward and make those——

Mr. MANLY. I can't speak for the Ferro-Alloys Association. I am not in it. But we are in the Tantalum Producers Association; we would be happy to do that with the Tantalum Producers Association.

Senator SCHMITT. Have you made that offer to the administration?

Mr. MANLY. The answer is yes.

Senator SCHMITT. And have you had any response?

Mr. MANLY. No, sir, I have not.

Mr. STRAUSS. In the 36 years since the Stockpile Act of 1946 was founded there have not been industry advisory committees formed with respect to the stockpile program. In some cases decisions have been made without consulting industry in any way, shape or form which later turned out to be crucially in error.

The most astonishing example was a decision by the Government that it wanted to stockpile alumina, which is the intermediate product between the raw material bauxite and the finshed metal aluminum. Industry was not asked as to whether this was a good idea or not. Alumina is a material with the consistency of talcum power with a high ability to absorb moisture. It cannot be stored out of doors.

The objective was set at 13 million tons of alumina which would have involved the construction of acres of concrete silos to house the material. When I asked my friends in the aluminum industry about this, they said, well, we don't know what the aging characteristics of alumina are because we never keep it around very long.

So here was a decision arrived at without any consultation with industry whatever. Fortunately, that particular decision has been rescinded. The present stockpile objectives are either bauxite, the crude material, or finished aluminum, which is, in the opinion of the aluminum industry, the way the thing should be done.

Admiral MOTT. That is exactly why, Senator, the 24 members of the Strategic Minerals Task Force, which represented the mining industry, the user industry, academics, and military people were unanimous in recommending that outside people should be brought in to make a qualitative and quantitative assessment of the stockpile. We came to the conclusion that was what must be done.

Senator SCHMITT. Could the as yet unnamed panel proposed in the President's plan serve this function?

Admiral MOTT. Well, I don't know what that panel is, sir. It says it is a panel of experts, but it doesn't say what kind of experts or who they will be and when they are going to begin their work. So how is it possible to tell? They say they are going to have a panel of experts and they will have outside people on it—and I forget what the exact language is—but it isn't specific enough to form a judgment.

Senator SCHMITT. Well, Mr. Manly, you also mentioned private stockpiling. Would that tend to avoid the alumina syndrome?

Mr. MANLY. I think it would, yes. We have experience with that. We have a facility in Switzerland and there are established industry stockpiles where companies get assistance, with low-interest loans and tax subsidies. The same way in Sweden. In Sweden you can increase your working inventories and get tax incentives in doing so. The advantage I see in this is that it does give you the inventories in the hands of the people who use it—the industry. They know the proper form for their processes. Also, stocks will be constantly replenished. The inventory will turn over and not become stagnant.

Admiral MOTT. I believe I sent you a copy of the French stockpile plan, sir. I had it translated after visiting Paris where the man who drafted it gave it to me. That is a specific example of what Mr. Manly was saying, and your staff also has a copy I provided to them.

Sir, the exact language used in this report is as follows: "We will direct a panel of experts to review the quality of materials in the stockpile and recommend such actions as may be necessary to ensure the quality of the stockpile." I made a note in the margin which says: "Who and When?" We just don't know and there is no

way to tell. That is not the only thing in here that needs to be specified in further detail.

Senator SCHMITT. Could the private sector organize offers from the various materials associations——

Mr. MANLY. I would like to speak to that. The Japanese Government through MITI, which Mr. Strauss referred to, has established a program between industry and Government to look at a critical materials purchase program. That program is being administered by a special metals stockpile association which is an industry-backed foundation in Japan. They are currently operating in Japan. I think we can learn a great deal from them about how industry and Government, financial institutions and labor unions can work together for the good of a country. The more white hairs I get in my head, the more I look at Japan and think there are many things we can learn from those people.

Senator SCHMITT. Well, there is no question about it. Unfortunately, we keep putting barriers of various kinds between those various groups and make it very, very difficult to work together without either tremendous financial sacrifice or vulnerability to a variety of legal actions.

Mr. MANLY. I think it is time we learned though, Senator. By the same token, the cooperative accord we have talked about today, could be established through the National Academy of Engineering and the National Academy of Sciences, or groups like the National Materials Advisory Board. The National Materials Advisory Board can provide a vehicle for industry and the members of the administration and various groups where they can sit down and talk about some of these issues and address some of the problems you are talking about.

Senator SCHMITT. Can you explain how the private sector stockpile would work and how there would be guarantees that the material was actually there at the time it was needed. Would you count it against the regular stockpile goals?

Mr. MANLY. I would say you don't need to count it against the regular stockpile goals, but you could. As an example, any person who runs a melt shop or a processing plant knows he needs to have a certain amount of inventory before the process. If that inventory is 3, 6, or 9 months, for example, you could work out such arrangements where the government could encourage an additional 9 months' or 18 months' supply held at the plants. This inventory would be constantly turned, assuring the quality and form of the material.

The way this could be accomplished is through interest free loans or tax incentives. This will enable industry to maintain considerably more inventory. The Government under title I of the Defense Production Act has plent of opportunity to come in and take our inventory even if the inventory is paid for in our own dollars and that has happened to us several times. A system already exists for the allocation of materials in time of crisis.

We have spoken about the cobalt shortage. The last time there was a cobalt shortage there was no release of cobalt from the stockpile, but under title I of the Defense Production Act the Government came in and took our cobalt that we had planned for certain

domestic applications and used it for military purchase orders. So the Government always has a way to get that inventory.

Admiral MOTT. May I ask Mr. Manly a question? Wouldn't this require legislation?

Mr. MANLY. I have already said I am not a specialist in workings of title III of the Defense Production Act. Our attorneys have been talking to the person who actually wrote the act. That person said that virtually anything can be done under the act. It is not abundantly clear to my attorneys or myself that it can be though.

Admiral MOTT. Well, we come back to the matter of partnership question again, Senator. There has to be a partnership arrangement between the Congress and the administration. All throughout this program plan you will find the statement—"We will seek legislation." I think that this is an area where they might have to seek legislation. If you don't have the kind of partnership arrangement I have suggested, it won't work.

Senator SCHMITT. To what degree do we face the threat of minerals cartels?

Mr. ANDERSON. I think the uranium batches are seeing the first round of that. A number of companies banned together and were led by South Africa, which has always had cartels in diamonds and has maintained the gold price to a more or less degree. I think that in uranium we saw one form and we saw it dissolve.

But we saw replace it is another element which is if you buy uranium from Canada it must be approved by the Government and the Government reserves the right at any time to change the price. So if an American utility bought uranium at $20 a pound and now 1 year later and it is a 20-year contract, the Government can intervene to change the price. Now the mine in Canada and the utility in the United States can't do it, but the Canadian Government can do it.

That to a limited degree is true in most places, and it certainly is true in Australia. The major uranium producers of the world are going to be Australia and Canada, Canada presently and Australia coming on line and South Africa to a minor degree.

Senator SCHMITT. Mr. Strauss.

Mr. STRAUSS. May I speak to that. The concept of a cartel is one that appeals to a lot of producers of a lot of commodities, but the ability to operate a cartel consistently over a period of time is a very difficult thing. In the case of copper, for example, the four leading exporting countries in the developing world formed an organization in 1967. They didn't call it a cartel. I think they had at one time the thought that they might succeed in controlling the world copper market. That has been in effect since 1967 and it has never accomplished anything much.

The place where the threat of cartels is greatest is in the case of those commodities where the production is highly concentrated in two, three, or four geographical sources. We have been talking a lot about cobalt. Chrome is another one. Platinum is still another one. Maganese perhaps, but less likely because there are more diverse sources of maganese. Diamonds, well, there is a book that has just been published about the diamond cartel indicating that maybe it is beginning to come apart at the seams.

The interesting fact is that the areas where the cartel threat is greatest is in those commodities where world reserves and world production is dominated by two countries. One is the Soviet Union and the other is South Africa. And although these two governments at present are ideologically very far apart, in practice if one examines what happens in the platinum and diamond markets, it does look as if at times they act in concert.

If one should envision the possibility of the present South African Government being replaced by a left-leaning government that would have strong ties with the Soviet Union such as its two neighbors, Angola and Mozanbique have, then I think the cartel threat would be very serious with respect to platinum, chrome, diamonds, and gold.

Admiral MOTT. I notice that Dr. Bement doesn't call this a cartel in his statement. He calls it "preemptive market manipulation," which is almost the same thing. We are preparing a book to be published by our council on Soviet intentions in Africa in collaboration with Ambasador Kohler's organization and I think it is pretty evident that the Soviets will do almost anything to deny us sources of minerals in southern Africa if they can.

Senator SCHMITT. Would you gentlemen agree that over the pre-World War II period there has developed in the Soviet Union a comprehensive, well-integrated military industrial complex that includes domestic access to all of the mineral and materials resources they need in order to supply that complex?

Mr. STRAUSS. The position changes from year to year. Certainly they are the most nearly self-contained of any great industrial power, far more so than we, because unlike our dependence on the marketplace, they put the first emphasis on access. And it is clear that where they do have to import materials they prefer to import materials from sources which are available to them by land-base transportation rather than by ocean transportation.

For example, they are not self-sufficient in regard to the supply of the raw materials for the aluminum industry, but they prefer to buy bauxite from Yugloslavia, Hungry, and Greece than to buy it from Jamaica, Guinea, Australia, or the other overseas sources.

The Bureau of Mines monitors these things and generally speaking of the 25 or 30 most important minerals, the Russians are either completely self-sufficient or almost self-sufficient in all but five. They are dependent on imports, of tin, tungsten, fluorspar, bauxite, and barite.

But even in those cases their import dependence in no case is more than 50 percent, whereas with the United States we have perhaps 20 minerals where our important dependence is 80 percent or greater.

Admiral MOTT. Sir, there is a chart on page 26 of this book, Strategic Minerals: A Resource Crisis, illustrating the five minerals on which the Soviets are import-dependent against those minerals on which the United States is dependent on foreign sources.

Senator SCHMITT. Gentlemen, we are going to recess briefly.

I want to thank this panel for their assistance. We may have some other questions.

Secretary Watt should be here shortly. I will go vote and return for his testimony.

[Recess.]

Senator SCHMITT. The hearing will come to order again. I apologize to you, Mr. Secretary, for the interruption of a vote and other things going on over there that nobody seems to understand.

Mr. Secretary, we have had some interesting testimony, both supportive and not so supportive of the plan and report that has been submitted to the Congress. If you would like to make any statement that you wish, we will have a few questions for you.

STATEMENT OF HON. JAMES G. WATT, SECRETARY, DEPARTMENT OF THE INTERIOR, ACCOMPANIED BY PERRY PENDLEY, DEPUTY ASSISTANT SECRETARY

Secretary WATT. Thank you, Mr. Chairman, for this hearing and your continued interest and attention to the subject matter of strategic minerals.

This is an issue that has received congressional interest and support and very, very little executive branch attention in the last several years. This administration did come on with a determination to strengthen the coordination and the activities and the capabilities of the executive branch in looking at the strategic minerals question.

I have with me Perry Pendley, Deputy Assistant Secretary for Energy and Minerals of the Department of the Interior. Mr. Pendley has lead responsibility in the Department and in fact carries a heavy burden with regard to the work of the entire executive branch.

We have coordinated much of our activity so that we can have a strong and coordinated position through the Cabinet Council arrangement. Really the statement that was long overdue on strategic minerals and was presented as a first step, it is not the conclusion but the first step, was prepared through that Cabinet Council arrangement and submitted to the public.

The issues of strategic minerals in the mining industry of course continue to come before the Cabinet Council. Last week the issue was discussed thoroughly with specifics being focused on the silver industry and the copper industry that are suffering so badly today as is the entire industry, and we have taken some actions that I think will be somewhat supportive, although not as dramatic as some would like.

Yesterday we had further meetings in the White House. Secretaries Regan, Baldridge, and myself, along with Ed Meese met with five representatives of the mining industry to discuss these several issues again, and we continue to focus high attention on this subject matter as it relates to the administration with the focal point being the Cabinet Council operation.

The importance of minerals and materials that you continue to draw the Nation's attention to was worked out, and you have played a key role in it, to put into law the purpose and objectives of Public Law 96-479, and we share that concern. On March 2 we appeared before you and talked about these general things that are of interest.

We have submitted our statement on strategic minerals and, as you point out, it has received grave reviews and criticism because

it didn't go far enough and it didn't do enough, and that is just exactly what we expected.

Several things are going on in the administration about this right now because of the dire economic conditions of the country, and particularly the economic conditions of the industry, and some would say not enough. Yet, this is one of the times that we must be most sensitive and show stability as we bring about the changes that are needed to restore economic recovery because that is the real life blood of the mining industry and strategic minerals.

There cannot be a strong position with regard to the mining industry unless our economic situation is very strong. That is where we must address our attention because of the very, very poor performance in the past several years to addressing these basic issues.

So the major part of the present plan centers on economic recovery, reducing and where possible eliminating, excessive, burdensome and unnecessary regulations. We think we are making progress in this and we hope to reduce unessential Government expenditures to stimulate investment in the private sector and to make public lands of the Nation available for the multiuse concepts mandated by Congress.

These public lands remain today among our greatest untapped assets and we have continued that struggle, Mr. Chairman, to make these lands available. I continue to be amazed at the hostilities of a few interests in America to making these lands available and useful for America and Americans. But we are determined and will never compromise in our commitment to implement the statutes that have been on the books for a good number of years that determine that these lands shall be made available for the American people.

There will not be a strong mining industry in America if we don't have full economic recovery and if we don't make the lands of America available to the country.

Over-regulation has been a big issue and we have seen the suffering consequences coupled with economic concerns that have hit us at the Bunker Hill situation in Idaho and we are trying to work it out.

Our April 5 policy statement was designed as a broad and decisive pronouncement of Presidential policy and commitment to the problems facing the country today. It is not a detailed master plan complete with time phased milestones. Therefore, we currently have no timetable for implementing the various parts of the report. Rather, this historic document, the first in nearly three decades, intends to guide the several departments and agencies of the Federal Government as they discharge their various minerals and materials-related responsibilities.

This document and the strong statement it contains regarding the role of materials in our society are now established Presidential policy and as such add vigor and strength to the activities of affected departments and agencies.

Allow me to quote from that statement:

This national minerals policy recognizes:

The critical role of minerals to our economy, national defense and standard of living;

The vast unknown and untapped mineral wealth of America and the need to keep the public's land open to appropriate mineral exploration and development;

The critical role of Government is alerting the Nation to minerals issues and in ensuring that national decisionmakers take into account the impact of their decisions on minerals policy; and

The need for long-term, high potential payoff research and activity of wide generic application to improve and augment domestically available materials.

With respect to your specific inquiry on an early warning system, we have concluded that such a system is already in place and further augmentation is unnecessary. We fully maintain and will continue to maintain the basic statistical collection and dissemination functions of the Government, a most noticeable example of which is the world renowned Mineral Industry Surveys of the U.S. Bureau of Mines. The expertise of the Bureau of Mines permits us to make forecasts, projections and evaluations which are vital to an understanding of our materials posture.

I would like to conclude my prepared remarks, and I probably ought to ask that the statement be included in the record because I skipped so quickly through it by pointing out that the action by the Congress is urgently needed on legislation that underpins our entire national security posture which is basic to many of the policy concerns expressed in Public Law 96-479 and endorsed and reiterated in the present statement of April 5, 1982.

Senator SCHMITT. Without objection, it will be included in the record.

Secretary WATT. Mr. Chairman, I think that with the statement in the record, I would be best to make myself and Mr. Pendley available to you for questions that you might have at this time.

Senator SCHMITT. Thank you, Mr. Secretary. It is a great pleasure to have you with us again on this issue as well as any other issues.

You indicated in your testimony that the report does not contain a schedule or management plan for carrying out the actions or the proposals within the report itself, the President's plan. Is there such a schedule or management plan within the Government?

Secretary WATT. There is a management plan for carrying these different functions out. There is not the timetable on it, but we are working with several activities and functions and coordinating them, the different dimensions though the Cabinet Council as it may need to come to that level.

Senator SCHMITT. Mr. Secretary, a concern that has been expressed here today is the difficulty that other entities who are interested in materials policy have interacting with the Government if there is no schedule or agenda. My question to you is how does the private sector and how does the Congress interact with the Cabinet Council in their movement to implement the President's plan?

Secretary WATT. We have smiled at that issue as it has been presented to us. We are available and our phone number is 343-7351. Anybody that wants to come and talk to us about it, we will be glad to talk to them.

Senator SCHMITT. Yes, but they don't know what you are working on. When is this specific issue going to become up for discussion?

Secretary WATT. In our efforts to bring about economic recovery we are working on everyth ng that has the immediate priority, and if they think we are not working on things they need to call it to our attention and get things underway as they think the agenda items might be better addressed. Frequently the private sector has a much better feel for it than we in Government will have and we need their help and assistance. We meet on a frequent basis with those interest groups and the private corporations and we would solicit any of their help that they could give us on it.

I don't see the need for a formal structure or another bureaucratic entity to address this. Yesterday, as I mentioned, the three Cabinet officers met in the White House with Ed Meese and these industry people and they don't have any trouble getting to us. I met with almost the same group the week before and frankly met most of their objectives.

We want to be available, and I have never heard a complaint that our doors are closed to anyone.

Senator SCHMITT. Well, I think the complaint is that people are used to interacting with some specific entity and the Cabinet Council doesn't seem to be that specific and it is difficult to know what the Council's agenda is going to be.

I guess the message is keep working with the issue that may be addressed by the Cabinet Council but don't expect the Cabinet Council to let you know when they are going to address an issue.

Secretary WATT. I think that is a good message and let me belabor that point. For too long America and the private sector have come to believe that nothing is happening unless there is a massive Federal plan of action like an energy plan or a strategic minerals plan.

This administration comes to the forefront thinking that the marketplace of ideas and the marketplace of products is the better place for most things to happen. So we encourage the private sector to come to us with their proposals and to use their creative genius. We know that everybody curses the bureaucracy, including me. I have spent a lifetime doing that.

Let them come forward with the ideas. They shouldn't have to sit around and say, well, until we see that Perry Pendley is going to do this on August 15, we are not going to move. We believe in the private sector and let them take some initiatives and proposals and not just wait for the bureaucracy to tell them what they are going to do so they can react. They need to initiate. We believe in the private sector.

Senator SCHMITT. In that regard, Mr. Secretary, there is a feeling that the administration and particularly the State Department and the Office of the Trade Representative view the world differently than the real world views it namely, that commodity prices, particularly strategic mineral prices, are somehow a function of market demand and are not significantly affected by the actions of governments around the world and other factors. They do not recognize that prices in many of these commodities are not controlled by the market. Unless our strategic minerals policies understand

that point, we will not have a domestic mining industry and refining industry.

Secretary WATT. I understand the concern. I don't always understand the solution. I think to talk copper for a moment, as that was the subject of discussions most recently and is so heavily hit, not many years ago most copper produced in the world was produced by private companies. Today I think about 45 percent of the copper produced in the world is produced by government companies, government financed, government-backed companies and they don't recognize market forces which is your point.

What do we do about that? Well, one thing we ought to quit doing is financing through the international development banks and Export-Import and the other types of Federal entities those foreign government companies to compete with our people. That was discussed yesterday and in the previous week in my office. I think it is a legitimate complaint of American industry that they have to compete with foreign companies that are subsidized in part by our grants and gifts to the foreign companies. That is a legitimate complaint.

Senator SCHMITT. Can we get Ambassador Haig and Ambassador Brock to agree with you on that?

Secretary WATT. They have agreed with me on that. Now getting implementation is the next issue and we are working on that. These loans have been going on for years.

Senator SCHMITT. Does Ambassador Brock meet with you specifically on any of these occasions?

Secretary WATT. Yes, he does.

Senator SCHMITT. The reason I ask that is I have included in the record a letter I have received from him relative to the uranium situation. The letter I wrote to the President on uranium imports ended up in his hands. He was very kind in his letter but not at all interested in seeing any kind of restrictions on uranium imports. He cited as a principal reason provisions of GATT that would potentially require U.S. payments to countries that could claim to be adversely affected by such restrictions.

He talked very appropriately in a philosophical way at least about free trade, but, Mr. Secretary, you know as well as I do that free trade has just about disappeared. It has been replaced by a one-way street for goods into this country and a continually more limited street for our exports into other countries. Do you have some contact with Ambassador Brock on this?

Secretary WATT. Yes, we do work with Ambassador Brock. We obviously, as you do, believe in free trade. The problem is we have got governments that are subsidizing our competition and too frequently with our own money.

Senator SCHMITT. But the point is we are still talking about free trade while they increasingly aggravate their barriers. We are going to have to play some hardball.

Secretary WATT. This administration has been moving in that direction and I think nobody is more willing than you. You consult with me very frequently on this subject.

Senator SCHMITT. Well, I do, and I am a free trader, too, but I think in order to get to a free trade marketplace we are going to have to do things differently than we have done in the past. I don't

see that happening at least in the responses that we get to inquiries about specific problems faced by, say, the domestic mining industry.

In that regard, it has been indicated to us that if we wait very much longer to do something about underpinning the domestic copper industry, when we have an economic recovery or when the defense demands for copper reach the proportions that we expect they will, the demand will be satisfied by imports at a rapidly escalated price rather than by a stable price provided by a domestic industry. The domestic industry will not have the capacity to surge to the needed level of production.

Secretary WATT. Your point is well taken. Our big fear is that some of the copper shutdowns will be permanent, and that they can't bring them back up when the recovery does come about later this summer and that can be very detrimental to us.

So we are starting to play hardball. We have had to play catch-up ball unfortunately with what we inherited. The Law of the Sea Treaty came, and I know of your personal interest in that because of the frequent phone calls you have on that, and this administration played hardball on that issue because what we inherited was such a mess from the past years. It takes much longer to rebuild and to redo the damages of the past government activities than if you are starting from scratch.

Unfortunately, I am learning over and over again that we are not getting into a new ball game, but we are getting into the seventh inning of a losing ball game and are trying to make fundamental changes of direction so that we can salvage an industry and an economic situation of the Nation. So hardball must be played and it is being played. You are wisely counseling that we are not playing hardball on enough fields at one time and I think your counsel is probably very good.

Senator SCHMITT. Well, it is tough, but things are turning to worms around us.

With respect to the Law of the Sea, have we begun to develop in a comprehensive way a free world alternative to the Law of the Sea?

Secretary WATT. Yes, we have. A Cabinet Council group has been formed on that. Perry Pendley heads that particular group and that is underway.

Senator SCHMITT. I wonder if Mr. Pendley would consent to consult with me on occasion on that. I have spent many years studying the alternatives to one-nation one-vote international regimes, not just this one, but others. We do have at least one successful model on how to develop those regimes based on a user concept. I would like very much to have some input to that and I am sure the rest of the committee would be interested also.

Secretary WATT. We will be seeking your counsel on that.

Senator SCHMITT. The President's plan on page 33 states that: "An analysis is underway to determine when the use of the Defense Production Act, would be more cost effective than stockpiling."

I might add that we have a problem on getting that act renewed. As you may have noted, the House-passed version has a considerable amount of baggage attached to it and we should have a

Senate-passed version before very long. We are going to have to go to conference with a very, very difficult situation and we will be in touch with you and others on that.

What materials are being considered for an analysis of the use of DPA as possibly more cost effective than stockpiling?

Secretary WATT. I would like to ask Perry Pendley to respond to that.

Mr. PENDLEY. Mr. Chairman, FEMA is doing that study and that analysis at the present time.

Senator SCHMITT. What does FEMA know about it? I should hope that you all are doing some of it. There should be some expertise in the Department of the Interior about strategic materials.

Mr. PENDLEY. Well, there certainly is, Mr. Chairman.

Senator SCHMITT. I haven't yet found very much in FEMA.

Mr. PENDLEY. They are making use of a study that was prepared by our Office of Mineral Policy and Research Analysis which is now a part of the Bureau of Mines, and they are making use of the skills and the expertise of our commodity specialists in the Bureau of Mines. So they do have the lead, given their stockpile responsibilities and the assistance they provide on the Defense Production Act, but we participate in that exercise. Wahughly rubber is another area in which they are doing some examination and an issue which I know you are quite familiar.

Senator SCHMITT. Well, I am sorry to sound exasperated, but, frankly, I have not noted that FEMA has the expertise to integrate all the variables that come into the analysis of whether the use of a DPA authority is more cost effective than stockpiling.

When do you expect that these analyses would be completed or do we have to go to them to find out?

Mr. PENDLEY. I am afraid you would have to go to them, Senator.

Senator SCHMITT. Many questions have been raised about the quality and quantity of materials in the stockpile beginning most recently with the President's task force prior to his inauguration. The plan acknowledges this problem and suggests a panel to review the stockpile.

I think there is a general consensus, Mr. Secretary, that adequate assaying is a tremendously important task and a data base that must be available before some other decisions can be made. Do you think the panel will be soon appointed?

Mr. PENDLEY. Mr. Chairman, the panel has already been established. The working group has been established with the General Services Administration and FEMA with participation from the Department of Commerce from their Office of Strategic Materials as well as from the Department of the Interior. We have received a number of proposals with regard to the manner in which that assaying procedure would be conducted and we are in the process of evaluating those various proposals at the present time.

Senator SCHMITT. Is this an all-Federal task force panel?

Mr. PENDLEY. The Government panel that is evaluating the proposals is, but that is not the panel that will do the evaluation of the materials. Those proposals examine a number of possible mechanisms for the study.

Senator SCHMITT. Isn't this ideal, Mr. Secretary, for a joint Federal/industry program? We have had testimony today that at least

some associations involved in specific mineral commodities would be more than willing to undertake the assay themselves without any cost to the Government.

Mr. PENDLEY. And we have received some proposals like that and those are some of the proposals that are being evaluated.

Senator SCHMITT. How long is this going to take?

Mr. PENDLEY. The evaluation of the proposals?

Senator SCHMITT. The evaluation.

Mr. PENDLEY. I wouldn't think it would take more than a few weeks.

Senator SCHMITT. What is your reaction to some kind of a joint venture? I should think that relying on the private sector's already available analytical capabilities?

Secretary WATT. It should be a very promising proposal.

Senator SCHMITT. But we are going to have to wait and look at other proposals?

Mr. PENDLEY. Mr. Chairman, we do have a number of proposals that have come in. Some are exclusively private sector and some are cooperative venture. Yes, sir, we will have to examine those proposals.

Senator SCHMITT. Was this a request for proposals that went out?

Mr. PENDLEY. It is not, no, sir. They were informally received proposals and they have been informally received self-initiated by the proposal over a period of months.

Senator SCHMITT. There has been no general request for ideas and proposals on this?

Mr. PENDLEY. Not to my knowledge, Mr. Chairman.

Senator SCHMITT. Mr. Secretary, has any attention been given to private stockpiling to supplement the current stockpile?

Secretary WATT. Your question is, Has any attention——

Senator SCHMITT. Has any attention been given to private stockpiling to supplement the current stockpile?

Secretary WATT. I think we are always aware that there is a substantial private inventory on all of these issues which gives you more of a secure base than if you just had the Federal. I am not sure I am responding to your question.

Senator SCHMITT. You are beginning to. My question though is, Is there any systematic evaluation of the private stockpile relative to the strategic stockpile to see where we stand overall on a particular commodity?

Secretary WATT. I don't know the answer to that.

Do you know?

Mr. PENDLEY. I know of no such evaluation.

Senator SCHMITT. The national defense stockpile, as you are aware, is very expensive to maintain. It has been estimated that with current materials in the stockpile acquired at an expenditure of $3.5 billion, the costs are something like $500 billion annually just to maintain that. The estimate contains, the debt service and things like that on it, and it would probably be $1 billion or more annually if we were up to the full stockpile goal which at current prices would be about $17.5 billion.

Private stockpiling would seem to offer an alternative, provided the arrangements could be made to guarantee that stockpile materials would be available when needed. So I would commend that to

you attention if it has not been brought to the Cabinet Council as yet.

Secretary WATT. Senator, as I reflect back on the many conversations you and I have had in private and in the previous hearing and now, I see why you are the effective Senator that you are. You have looked at this subject matter for a professional lifetime and are frustrated with the executive branch's failure over these last many years to really address this issue as you feel it should. I think that is why you are an effective Senator.

Senator SCHMITT. Well, I got my team in the ball park finally and I get a little bit more frustrated when nothing seems to happen, Mr. Secretary.

Secretary WATT. Well, I look at this from an 18-month perspective, and in 18 months this administration under President Reagan and under the leadership that several of us have given it has made more progress in the time frame of 18 months than was made in the last many, many, many years. So I look at our accomplishments with pride and satisfaction of significant accomplishments in the time frame.

You look at the same results and are irritated because the past administration didn't do anything and turned their back on a subject that is dear and close to your heart. Your judgment is correct. They should have been addressed. People have been calling for attention on this for many years. It is not a lack of knowledge and it is not a lack of knowing what to do in some instances. It is a lack that the political leadership has not given this the priority that you particularly believe it deserves and I happen to share your view. But I have only been onboard 18 months and the President has and we have done a phenomenal job in that 18-month period.

Senator SCHMITT. Mr. Secretary, I have to agree with your statement to the point that there have been some actions taken and they are much appreciated and we are long overdue and I admit to my frustration in not seeing more. But, frankly, I am scared and I was scared during the last administration and I get more scared every year.

Maybe I spend too much time on the Select Committee on Intelligence and too much time in the Subcommittee on Defense Appropriations and get the so-called Intelligence Community Threat Briefing. Whether you believe all the details, it is awfully hard to avoid the conclusion that the Soviet Union has established a military industrial complex that is largely self-sufficient in mineral resources. And as part of the overall plan they have established for domination of Earth's activities it has included an attempt to deny us by political or subversion or otherwise access to resources we need as a maritime nation. The Soviet Union is a continental nation and they have reinforced that by their basic policies. We are a maritime nation and nothing is going to change that.

We can do far better in terms of domestic mineral resource development than we have done, but we must be cognizant of the importance of this particular aspect of the international confrontion that freedom and repression have at this point in the history of mankind. And I am literally scared because in a national emergency, if that should begin tomorrow, I frankly don't know how we are

going to supply for either our economic or defense needs with respect to strategic materials.

Secretary WATT. We could not.

Senator SCHMITT. That is exactly the answer, we could not. That is why any delay that perpetuates that situation is a delay that is putting the freedom of Americans at stake, not to mention their lives.

Secretary WATT. That is an absolute accurate assessment and it is alarming. If the American people understood how vulnerable we are to Soviet attack, their submarine missile capability, their submarine capability is so far in excess of their needs as a land-based nation and they have the capability to curtail the sealanes to stop our energy and our mineral imports that this country is so dependent upon.

In January 1981 when we took the stewardship responsibilities over for these areas of interest 40 percent of our crude energy needs were coming from OPEC and Arab nations and then you add the fact that an additional increment is coming in from Alaska across the high seas. This Nation is vulnerable in energy needs and in mineral resources.

I have poured my life these last 18 months into trying to change this to open up the tremendous wealth that we have on the public lands for energy and minerals and I have been abused, I have been fought and, unfortunately, the House of Representatives is not under leadership that sees the clear call that you have just so wisely enunciated. I have had to fight those Members of the House of Representatives who would not allow us to secure a free future for America. The situation is much more critical than you are free to discuss here in this public forum.

When I have to battle as I have had to battle, and thank you for the assistance you have continued to give us this last 18 months and I appreciate that, but I have had to battle those forces in this country that would seek to deny us the opportunity to be strong. It is alarming and we need to move at a much more rapid pace than we are, but under the constraints and the hostilities that we have had to endure from our own officials, and not in the executive branch, I must add, it is marvelous that we have made this kind of success.

I encourage you to keep the pressure on me and everyone else because you are right and you are calling the shots as I see them and I wished I had the freedom to move with the strength to bring about the changes that we really need to allow America's greatness to be restored and protected as you have outlined it.

Senator SCHMITT. Mr. Secretary, I will keep the pressure on. There is no question about that.

Secretary WATT. I will bet you do.

Senator SCHMITT. We can protect the ability of this country to respond to international crises and to avoid the threats to our economic well-being that can come as a result of denial of strategic materials resources. We can do that and at the same time balance the protection of the values, environmental and otherwise, that we hold so dearly in this country.

Secretary WATT. Clearly we can.

Senator SCHMITT. But if we do not seek that balance, if we refuse to even try to seek that balance or get discouraged in the task, then I am afraid, seriously afraid, that the price will be the loss of freedom. I hope that we through this committee and you through your efforts can continue to work together. We may not always agree on the specifics, but I think we agree on the general direction that we must head.

Mr. Secretary, I know you have a 4 o'clock meeting. Dr. Keyworth is here and I will have a few more questions for the record, particularly with respect to some kind of a schedule of the inventory in the Federal lands relative to strategic mineral resources and on a number of other aspects of the development of alternatives to stockpiling, such as alternatives through research and development that will produce substitutes for critical minerals.

Thank you Mr. Secretary.

Secretary WATT. Thank you, Mr. Chairman.

[The statement follows:]

STATEMENT OF HON. JAMES G. WATT, SECRETARY, DEPARTMENT OF THE INTERIOR

Mr. Chairman, Ladies and Gentlemen: It gives me great pleasure to appear before you today to discuss the President's National Materials and Minerals Program Plan and Report to the Congress of April 5, 1982. As you know, since the early days of this Administration we have been working to give the materials issue the attention it merits by the role it plays in our national defense, economy and standard of living—attention that had been missing. Clearly, notwithstanding the passage of the 1970 Mining and Minerals Policy Act, there has generally been a dearth of high-level attention given to minerals and materials issues.

The importance of minerals and materials was well understood by the Committee on Commerce, Science and Transportation as you worked to put into law the purpose and objectives of P.L. 96-479. We share your concern and have worked vigorously to move aggressively to diminish America's materials vulnerability. We shared that concern when on March 2, 1981, we appeared first before your Committee to address these important issues.

Our commitment and our interest was further demonstrated when on March 13, 1981, President Reagan called for the expenditure of $100 million for the first major addition to our strategic stockpile in over two decades. $78 million went to purchase cobalt, a material which, as you well know Mr. Chairman, is critical to our national defense yet seriously short of the National Defense Stockpile goal.

Partly in response to section 5(e) of P.L. 96-479 and partly in response to my own deeply felt concerns, we recently reorganized the Bureau of Mines to improve its capacity to assess international minerals supplies and to redirect its research activities to focus on important minerals. We redirected several million dollars to increase the level of the Bureau's mining and metallurgical research in strategic and critical minerals. In addition, we have strengthened mineral and energy resource activities within the Bureau of Land Management and we have returned to multiple use over 20 million acres of public land. More recently, we created the Minerals Management Service elevating the former Conservation Division of the U.S. Geological Survey and all the OCS leasing functions from several other bureaus to an enhanced position to assure effective and efficient mineral activities.

As John Marcum will indicate, we have reestablished the Committee on Materials to better coordinate our material research and development activities. The Department of the Interior has committed substantial resources to that activity and we are dedicated to its success.

You have specifically requested our assessment of America's materials and minerals situation. We believe that at least two related but very dissimilar problems currently coexist. At the present time there are no materials or minerals shortages. As a result of the general economic downturn which has long persisted, there is actually an oversupply of minerals and materials in the U.S. and in the world at large. However, if certain defense emergencies occurred today, there could well be shortages of strategic materials, not only in the United States, but also, and perhaps much more severely, in the countries of our allies. As you are no doubt aware, min-

eral policy does not exist in isolation. Rather it is a part of overall materials policy which is an extension of the Nation's economic policy.

This Administration clearly understands and believes in these relationships. As a result we have focused primarily on strengthening the Nation's economic health. A major part of the President's plan centers on reducing and, where possible, eliminating excessively burdensome and unnecessary regulations. We are attempting to reduce unessential Government expenditures, to stimulate investment in the private sector, and to make the public lands of the Nation available for the multiple use concept mandated by Congress. These public lands remain today among our greatest untapped assets.

For these reasons, President Reagan pushed hard for the National Economic Recovery Tax Act of 1981. Vice President Bush moved aggressively to reduce overly overbudensome and onerous regulations. At the same time, I sought to return balance to the management of America's public lands to permit the development of America's energy and mineral resources.

Always conscious that national security interests must come first, President Reagan created the Emergency Mobilization Preparedness Board (EMPB). This Board which is chaired by National Security Advisor William Clark, brings together top policy representatives of 23 key Federal Departments, Agencies, and Executive Offices. Their purpose is to continually examine and assess the defense readiness posture of the Nation. As a member of the EMPB, the Department of the Interior works daily with the Federal Emergency Management Agency (FEMA) in the identification of specific problems relating to each of the 80 metals and minerals that have been designated as strategic and critical for stockpiling purposes. Because our activities in this area are ongoing and extensive, I will not attempt to describe them in detail. However, for your information, the highlights of Interior's programs connected with the EMPB are activities regularly included in FEMA's semiannual "Stockpile Report to the Congress," the most recent of which is appended to my statement.

The President's April 5, 1982, Policy Statement was designed as a broad and decisive pronouncement of Presidential policy and commitment to the problems facing the country today. It is not a detailed master plan, complete with time-phased milestones; therefore, we currently have no timetable for implementing the various parts of the report. Rather, this historic document, the first in nearly three decades, intends to guide the several departments and agencies of the Federal Government as they discharge their various minerals and materials related responsibilities.

This document and the strong statements it contains regarding the role of materials in our society are now established Presidential policy and as such add vigor and strength to the activities of affected Departments and Agencies. Allow me to quote from that statement:

"This national minerals policy recognizes: The critical role of minerals to our economy, national defense, and standard of living; the vast, unknown and untapped mineral wealth of America and the need to keep the public's land open to appropriate mineral exploration and development; the critical role of government in alerting the Nation to minerals issues and in ensuring that national decision-makers take into account the impact of their decisions on minerals policy; and the need for long-term, high potential payoff research activity of wide generic application to improve and augment domestically available materials."

With respect to your specific inquiry on an early warning system, we have concluded that such a system is already in place and further augmentation is unnecessary. We fully maintain and will continue to maintain the basic statistical collection and dissemination functions of the Government—a most noticeable example of which is the world renowned Mineral Industry Surveys of the United States Bureau of Mines. The expertise of the Bureau permits us to make forecasts, projections and evaluations which are vital to an understanding of our materials posture.

I would like to conclude my prepared statement by respectfully pointing out that action by the Congress is urgently needed on legislation that underpins our entire national security posture, and which is basic to many of the policy concerns expressed in Public Law 96-479 and endorsed and reiterated in the President's statement of April 5, 1982. The Defense Production Act of 1950 is currently scheduled to expire on September 30 of this year. This Act is absolutely essential to the maintenance of our defense industrial base. Title I provides authority for priorities and allocations, title III for supply expansion, and title VII for voluntary agreements. Administration witnesses have testified before several committees of the Congress on the need for extending the basic Act for a period of 5 years. Therefore, in conclusion, Mr. Chairman, I should like to urge that your Committee do what it can to

assure that the Defense Production act does not lapse on September 30 of this year, a date which is not too far off.

Mr. Chairman, we deeply appreciate the opportunity to have appeared before you this morning and are prepared to answer any questions.

[The following information was subseqently received for the record:]

QUESTIONS OF THE COMMITTEE AND THE ANSWERS THERETO

Question. Could you provide a list of the offices responsible for the task and a schedule for completion of all the actions spelled out in the President's Plan?

Answer. Reviewing the stockpile and most cost-effective uses of the Defense Production Act is a task being performed primarily by the Federal Emergency Management Agency. The review of the first material—cobalt—is in the final stages of preparation. As yet, no schedule has been established for the other materials.

The task of inventorying and reviewing withdrawals on federal lands falls to the Department of the Interior and the Bureau of Land Management. Inventory was completed in April 1980 and a formal review schedule has been established. Already we have revoked or are in the process of revoking obsolete withdrawal orders on over 14 million acres withdrawn from the mining law and 5.6 million acres withdrawn from the leasing laws.

Question. Did the President's Plan analyze the potential of private stockpiling of critical materials for defense purposes to supplement the current National Defense Stockpile?

Would the Cabinet Council on Natural Resources examine the concept as a supplement to the National Defense Stockpile? If yes, by when could it be completed and shared with me?

Could government incentives sufficient to bring about private stockpiling be provided under existing legislation or would new legislation be required?

Answer. Although the President's Plan did not analyze the potential for private stockpiling of critical materials, it may be an alternative for supplementing the current National Defense Stockpiling. A major implication of such a course of action, however, is that it would most likely necessitate an amendment to the provisions of the Internal Revenue Service Code affecting tax credits. It is possible that Title III of the Defense Production Act (DPA) could be interpreted to provide incentives for private stockpiling, but in that case, appropriations under DPA would have to be authorized by Congress.

Question. What materials are being analyzed now, and which will be analyzed in the near future?

When will the analyses be completed?

Will the results of the analyses be given to this Committee?

Are the analyses considering other means such as substitution or technological developing to reduce import dependency?

Answer. Federal Emergency Management Agency (FEMA) is the lead agency conducting the analysis to determine when the use of DPA would be more cost effective than stockpiling. Presently, the analysis of cobalt, the first material to be studied, is in the final stages of completion. After that, the platinum group metals, refractory bauxite, titanium, and guayule will be analyzed.

The analyses of the issue involved in the stockpiling including the use of Title III of the DPA necessarily included the effects of substitution and changing technologies. Currently, the Bureau of Mines is embarked on a number of research projects investigation substitution as well as improved uses of materials to assist in reducing import dependence.

Question. Will the Cabinet Council on Natural Resources and Environment formally address any of these issues in the near future?

Answer. The issue of unfavorable trade agreements and subsidies of foreign mining operations has far-reaching implications. The United States has participated in the activities of multinational lending institutions. However, the Administration recognizes that, at the same time we are assisting in the development of foreign countries, we are often increasing our own dependence on foreign sources of supply.

Although we have recognized the importance of this complicated issue, it has not yet been identified as a specific problem for Cabinet Council consideration. In addition, because of the sweeping nature of the problem the issues involved may fall under the jurisdiction of more than one Cabinet Council.

Senator SCHMITT. Dr. Keyworth, the President's science adviser and the head of the Office of Science and Technology Policy, is here.

Jay, I want to welcome you. We have had a parade of New Mexicans. It is great to have you.

Dr. Keyworth, again you were not here for earlier testimonies. The President's plan has received high marks in intent and relatively low marks in what is obviously going to be done to implement it.

With that forewarning, I would ask you to proceed with whatever statements you may have and I will have a few questions for you.

STATEMENT OF DR. G. A. KEYWORTH, SCIENCE ADVISER TO THE PRESIDENT AND DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY POLICY, ACCOMPANIED BY JOHN MARCUM, ASSISTANT DIRECTOR FOR ENERGY AND NATURAL RESOURCES

Dr. KEYWORTH. Thank you very much, Chairman Schmitt.

I am pleased to be here today to discuss the national materials and minerals program plan and report to Congress which the President, as you have stated, has recently transmitted.

We are very proud of this report and consider it a significant achievement to have prepared a policy statement of this kind, the first since that of President Eisenhower on December 1, 1954.

We consider this year's program plan as only the beginning of a program of continuous high-level attention to the plight of this Nation's materials and minerals situation. We fully understand the vital nature of materials to our industrial economy. Without competitive supplies of raw materials, our manufacturing endeavors will have difficulty in the global competition that exists today, and without adequate advancements in the science and technology of materials we lose our competitive edge for developing the products that must be constructed from these vital materials.

I would like to express my appreciation also to Chairman Schmitt and the other committee members for recognizing the importance of addressing the need for high-level coordination of the many materials and minerals activities within the Federal Government.

This administration shares this concern and is committed to dealing with the increasing dependence of the United States and the free world upon foreign sources for strategic and critical materials.

This national materials and minerals program plan and report to Congress sets forth the policy, priorities, and coordinating structure to deal with the many parts of this issue.

Now let me briefly discuss what has been done and what is planned to address this issue. The Cabinet Council on Natural Resources, made up of Cabinet officers and chaired by the Secretary of the Interior, produced the plan and report to Congress. The Cabinet Council provides an excellent policy review mechanism that insures high-level action on important materials policy issues and on a timely basis.

Following completion of the Cabinet Council program plan, the President himself reviewed and transmitted it to the Congress. In his message the President personally emphasized the critical role of minerals and materials to our economy, national defense, and even our standard of living. He also focused attention on the need for the Federal Government to concentrate its R&D effort in this area on long-term, high-risk, and high-potential payoff activities of wide generic application that are not being pursued by the private sector.

The President expressed that this policy is responsive to America's need for measures to diminish materials vulnerability by allowing private enterprise to preserve and expand our minerals and materials economy.

Under the plan the administration will continue its review and reform of excessively burdensome or unnecessary regulations and statutes which adversely affect the domestic minerals and materials industry. Cost-effective approaches are being considered for mine safety, noise standards, lead standards, and others. Administrative reforms, such as streamlining the process of recording unpatented claims, are in progress. Land access regulations, the Clean Air Act, and the Clean Water Act are all being reviewed for cost efficiency and adequacy.

The materials stockpile policy is effectively addressed. The administration has undertaken the first stockpile purchase program in 20 years. In fiscal year 1981 the Congress provided $100 million for acquisition of cobalt, and the President requested an additional $106 million for fiscal year 1982, which is currently limited by resolution to $57.6 million.

Our administration will streamline the stockpile planning process through 5-year planning guidance for GSA acquisitions and disposals and through a fiscal year plan that matches annual budget ceilings, market conditions, immediate strategic requirements as well as GSA purchase activities.

In the broad area of R&D the administration has previously provided important new tax incentives in the Economic Recovery and Tax Act which should stimulate the private sector R&D and is also reviewing patent policy with similar objectives in mind.

My Office, in concert with each department and agency, has been specifically tasked to direct senior officials in the applicable agencies in maintaining effective mechanisms for constructive R&D program coordination in implementing the national minerals and materials policy.

Our Government-funded R&D activities, except those related to national security, will concentrate on long-term, high-risk, high-potential payoff projects with the best chance for wide generic application and improving the Nation's economy.

Now as you are well aware, the President's April 5 report to Congress reaffirmed the Committee on Materials, so-called Comat, under our Federal Coordinating Council for Science, Engineering and Technology, which we affectionately call FCCSET and I chair, for the purpose of coordinating Federal minerals and materials R&D.

To bring you up to date, we are moving ahead rapidly in this endeavor. FCCSET has already had its first meeting to discuss the re-

activation of Comat. I have asked John Marcum, who is here with me today, and serves as my Assistant Director for Energy and Natural Resources, to chair the Comat to insure that it receives the required high-level attention from the involved departments and agencies.

Comat members will include individuals knowledgeable in materials R&D as well as assistant secretarial-level people in their respective departments or agencies. It is our intention to involve both high-level policymakers and those program managers involved in materials and minerals R&D within the agencies to expedite policy implementation and to coordinate policy based on complete and factual information.

Additionally, we have recruited an executive secretary for Comat who has had close involvement with the previous Comat's since first organized in 1975. He is Murray Schwartz, a ceramic engineer who has been involved in materials R&D for all of his professional life in industry and Government as well as academia.

Comat's first order of business will be to carry out a complete inventory of agency projects to determine the adequacy of its data base on Federal minerals and materials R&D for analysis or assessment purposes. This in itself is not an easy task, because our Federal bureaucracy has grown through the years, stretching out in many diverse directions.

As previous Comat efforts have shown, assessment and technical coordination cannot be accomplished effectively without this data base analysis. With a good data base we believe that it will be possible to insure that our Federal funds are being used as efficiently as possible and to redirect programs when necessary to better serve the national interest. Also, the individual agencies will become better informed on the total situation and be able to make their respective programs more effective.

We will be particularly sensitive in this process to the need to emphasize promising materials research areas such as rapid solidification technology, substitution, and recycling of materials and fundamental materials science.

The first Comat meeting is scheduled for next week on June 30. The agenda will include planning for R&D policy implementation, a revised Comat charter and initiation of an interagency inventory of existing materials and minerals programs. With a clear Presidential policy, including specific Comat responsibility, we have an excellent opportunity to effectively address an important R&D policy program need. I am confident that Comat can succeed in this effort.

In closing, I would like to assure you that the minerals and materials area and its problems will continue to receive attention at the highest levels of the executive branch. Answers to these problems are often complex in nature, and a number of solutions must always be considered, one of which is research.

Through Comat, my Office will give minerals and materials technology close attention and assure high-level consideration of these issues throughout the executive branch.

Thank you again for this opportunity to testify on this most important matter. We will keep you informed on our progress.

I would be happy to answer any questions you have, Senator.

Senator SCHMITT. Doctor, I will try to get several questions in here quickly and then we will submit the rest for the record because I have to go vote and that way I don't keep you sitting there for 15 minutes.

You have a particular task in Public Law 96-479, an assessment of national materials needs related to scientific and technological changes over the next 5 years. When can we expect to see that assessment?

Dr. KEYWORTH. Since Mr. Marcum is actually devoting himself to this activity, let me ask him to respond to the question.

Mr. MARCUM. Senator, I would consider the initial response to that as having been embodied in the president's national materials and minerals program plans, which he submitted to the Congress in early April. We will continue to carry out an inventory and assessment of materials R&D through the Comat.

Senator SCHMITT. Do you think the plan fills that requirement?

Mr. MARCUM. No. It's a start toward filling the requirement. We are now setting in motion the preparation of an inventory, which Dr. Keyworth described, and which will serve as the basis for a full description of Government programs and plans through this period.

Senator SCHMITT. When do you expect to have an interim report at least on that?

Mr. MARCUM. Our objective is to complete the inventory, if at all possible, within the next several months and certainly within 6 months. At that point we should be in a position to report on the results. However, you should be aware that this is not a simple task if such an inventory is to be useful for assessment purposes.

Senator SCHMITT. So we could expect to have it prior to the budget cycle for next year, at least the congressional aspects of it.

Mr. MARCUM. Yes. In fact, we want it to be used for that purpose.

Senator SCHMITT. The present plan states that "the domestic minerals industry is no longer as advanced in the minerals processing technology as many of America's foreign competition." I don't understand the syntax there, but that apparently is the quote.

Do you perceive that there is a role for the Federal Government in helping the industry catch up or is this something the marketplace should determine?

Dr. KEYWORTH. I think there are responsibilities in both sectors, Senator. Clearly, as I mentioned in my testimony, many areas where the research is going to have a long-term payoff are unlikely to be supported by the private sector, and the Federal Government does have a major responsibility.

We are certainly trying to pursue a coordinated program in materials science, and I might even mention that we are giving some serious thought at this time to a centralized materials science research center. I think that the many agencies and departments that actually support diverse materials science activities must be coordinated to address the central issue that this hearing and my testimony have attempted to address.

Within the private sector there are important areas of interest and activity. One of the better known is the role of composite materials technology, for example. While we are seeing very, very significant strides in this area within the private sector, I think it is a

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clear-cut partnership area in which the respective roles of industry and Government must be determined on totally pragmatic considerations.

Senator SCHMITT. Do you expect Comat to be able to provide a continuing assessment of research and development related to mineral processing technology and substitute materials as they relate to our national vulnerability to import restrictions?

Mr. KEYWORTH. Comat and my office will be very, very interested in this question. But I would like to emphasize that I think the maintenance of an analytical data base that can address the most gaping holes is one of the most critically important elements in the short-term.

Senator SCHMITT. Well, that is the last call, Doctor. We will have some more questions for the record. I apologize. I wanted this dialog to be longer but I can't control the flow of activity on the floor of the U.S. Senate yet any way.

[The following information was subsequently received for the record:]

QUESTIONS OF THE COMMITTEE AND THE ANSWERS THERETO

R&D ON IMPROVED MINING PROCESSES

Question. The President's plan states that "The domestic minerals industry is no longer as advanced in mineral processing technology as many of America's foreign competition."

What is the role of the Federal government in helping industry catch-up in mineral processing technology?

What types of new research and technology assistance efforts, if any, does the Federal government propose to help industry overcome this deficiency?

Answer. This Administration is very concerned over the ability of its minerals industry to maintain an advanced technological position worldwide. Two steps which have been taken to provide a favorable economic climate to enable industry to perform the needed R&D are initiation of R&D tax credit incentives and regulatory cost benefit analyses. The latter should reduce the need for industry to spend a disproportionate amount of its R&D funds on meeting severe environmental standards rather than on R&D to improve productivity. In addition, the Federal Government is continuing its strong R&D program in the Department of Interior's Bureau of Mines on long-range problems of a generic nature associated with mineral processing and which is highly supportive of the mineral industry's needs.

It is still too early to assess the results of the steps described above and to decide what, if any, additional efforts are needed. The Cabinet Council on Natural Resources and the Environment has been in close contact with minerals industry representatives and is keeping abreast of its problems.

MATERIALS RESEARCH

Question. The President's plan states that the government should focus on "long-term, high risk technology with the best chance for wide generic application."

Can you be more specific and describe this type of technology for the materials and minerals area and identify the specific types of materials and minerals research the Federal government should support that it is not already doing?

Answer. This guideline for focussing the Federal minerals and materials R&D program means that, generally, it should be research that is not economically feasible for industry to do because of its long-range nature. In addition, it should be of a generic nature so that it would be useful to as large a segment of that industry as possible. This guideline does not apply to specific types of materials and minerals research but is a means of differentiating between industry and government roles in this area. Defense-related R&D is excluded from this guideline.

COMAT ACTIVITIES

Question. In your testimony, you stated that "COMAT's first order of business will be to carry out a complete inventory of agency projects to determine the adequacy

of the data base on federal minerals and materials R&D . . ." You also stated that "the maintenance of an analytical data base that really address the most gaping holes I think is the most critically important element in the short-term."

When will the inventory be completed, and when will the "most gaping holes" be identified?

Will COMAT attempt to develop a federal R&D agenda for materials and minerals? If yes:

When will it be completed?

Will it specifically examine the area of resource assessment technology, mining and extraction technology and development of substitute materials to determine R&D the federal government should support?

What actions will OSTP take to assure that federal R&D is undertaken to meet the "most gaping holes?"

Answer. We have just started to prepare the COMAT inventory. As you are aware, the minerals and materials R&D area is large and complex with over $1 billion being spent annually by 17 departments and independent agencies. Collecting and assembling the information for the inventory so that it will be useful for coordination, assessment, and planning purposes must be done with care. However, we are planning to have the data base of the inventory completed by this fall which should be least enable us to identify any "gaping holes" or other problems for budget review purposes. The analytical part of the inventory will require more extensive work, but should be completed by early next year. Using the inventory, we will be able to relate national needs to R&D objectives and funding allocations to determine where redirection of R&D might better serve our national needs.

COMAT will coordinate the Federal minerals and materials R&D program essential to the national security, economy, and standard of living. It will identify key points of emphasis, as well as problems, related to national minerals and materials technology and availability needs and coordinate the development of long-rnage plans for an effective R&D program to meet clearly defined national objectives. This is a relatively large undertaking which we are only just starting, so that it is not feasible to announce completion dates at this time. All materials areas in your question will be assessed by COMAT, as the inventory will include R&D on the life cycle of materials from exploration through recovery, processing, manufacturing, utilization, recycling, and disposal. Recommendations by COMAT for needed actions will be made by OSTP to the President and to the Cabinet Council on Natural Resources and the Environment for resolution of significant policy issues.

ASSESSMENT OF NATIONAL MATERIALS NEEDS

Question. Section 5 of P.L. 96-479 directs OSTP to prepare an assessment of national materials needs related to scientific and technological changes over the next five years. Such assessment shall be revised on an annual basis. The intent as expressed in House Report 96-672 of the assessment was to help identify R&D needs in the materials area. We have not reviewed the assessment.

If the assessment has not been completed, when will it be completed?

When will it be submitted to this Committee?

Answer. OSTP participated in the development of the President's National Materials and Minerals Program Plan, including its materials and minerals R&D section, which was forwarded to the Congress on April 5, 1982. Pursuant to the Plan, we have reconstituted the COMAT, and the inventory and other materials it is preparing will serve as the basis of future OSTP assessments. We will keep you informed of our progress and provide these results and our assessments to you promptly.

Senator SCHMITT. I hope to return within 10 minutes, and Mr. Dedrick, we will take your testimony as quickly as we possibly can.

[Recess.]

Senator SCHMITT. The hearing will come to order.

Mr. Secretary, if you would come forward, please.

Mr. Secretary, if it is possible, I would appreciate a summary of your testimony and then we can ask you a few questions and supply others for the record.

STATEMENT OF ROBERT G. DEDERICK, ACTING UNDER SECRETARY FOR ECONOMIC AFFAIRS, DEPARTMENT OF COMMERCE, ACCOMPANIED BY ROBERT WILSON, DIRECTOR, DEPARTMENT OF STRATEGIC RESOURCES

Mr. DEDERICK. Let me say that I am pleased to be here before you today.

With me is Robert Wilson, Director of the Department of Commerce's Office of Strategic Resources.

I will submit my written testimony for the record and summarize that for you, if I may.

In April President Reagan forwarded his national materials and minerals program plan and report to Congress. The program plan sets forth the basic materials and minerals policy of this administration, which is to decrease U.S. minerals and materials supply vulnerability.

The program has five major features that are consistent with the administration's overall philosophy.

First, our materials policy places maximum reliance on the marketplace.

Second, the policy addresses the entire materials cycle.

Third, the policy recognizes the important relationship of materials to national security.

Fourth, the program plan includes long-term as well as short-term initiatives.

Fifth, implementation of the program plan will be a Government-wide initiative.

The Department of Commerce was a major participant in the development of the materials program plan. DOC chaired working groups which developed recommendations on materials research and development, materials supply and demand analyses and regulatory reform.

The Department of Commerce also prepared a study of critical materials requirements of the U.S. aerospace industry which concluded that we should take steps to improve emergency preparedness, increase the reliability of raw material supply, increase the reliability of processed materials supply and increase materials supply options. Those recommendations are fully consistent with the President's national materials and minerals program plan and appropriate actions are underway to implement them.

Within Commerce we are shifting our focus to implementing the program plan. The Office of Strategic Resources under Robert Wilson has been established to coordinate the Department's minerals and materials activities and we are focusing our attention on strengthening the competitiveness of the materials industries and reducing industry vulnerability to supply disruptions of strategic materials.

Among our planned activites are the following:

One. Developing an information base and improving end-use analysis through in-depth industry studies. Our followup to the aerospace report will evaluate the critical materials requirements of the steel industry. We intend to send this study to Congress in early 1983.

Two. Working with the interagency Minerals Information Coordinating Committee to fill important data gaps and to improve Government analysis for policy development. We are especially interested in developing better information on the regulatory costs of materials industries in order to assist the overall regulatory reform effort. We are also developing a system for more accurate forecasting of minerals and materials demand.

Three. Addressing industry concerns about emergency preparedness. Together with GSA and FEMA, we are assessing the state of the materials in the national defense stockpile and are instituting better stockpile management techniques. We are continuing to develop basic economic data for stockpile planning and are consolidating and improving the priorities and allocations system under title I of the Defense Production Act.

Four. Continuing research and development on substitutes for crititical materials in essential uses. The National Bureau of Standards is looking into a variety of innovative enginering materials known as synterials. We are also investigating the creation of cooperative industrial research and development efforts in particular materials research areas, and are initiating a materials substitution information program, part of which will be an industry workshop on chromium substitution to be conducted in October.

Five. Improving the investment climate for seabed mining through the development of seabed mining regulations, the conduct of ocean mining research, negotiation of reciprocal arrangements among seabed mining nations, and participation in the Law of the Sea activities. We are also investigating the development of more accessible mineral resources on the Outer Continental Shelf.

Six. Developing a regular industry consultation program with industry and association representatives. We especially want to be aware of the views of the materials processing and consuming industries to assure that they are adequately presented in the various Cabinet councils. DOC is also sponsoring industry workshops to assess Government and private sector roles in developing materials risk management programs.

In summary, this administration does have a comprehensive materials and minerals program plan. This administration has the coordinating mechanism in place to implement the plan. Now we have to concentrate on the implementation phase.

For its part Commerce has decided to do precisely that, and indeed has begun to do so.

I thank you very much, Mr. Chairman.

Senator SCHMITT. Thank you.

The administration presumably has decided not to sign the Law of the Sea Treaty; is that correct?

Mr. DEDERICK. As I understand it, in its present form the administration is opposed to it.

Senator SCHMITT. Assuming that were not done, is there any effort within Commerce or the administration presumably in cooperation with the State Department to develop alternatives?

Mr. DEDERICK. Well, a great deal of work is still going on in this area, sir. Again, as I understand it, much of it is highly sensitive and confidential, and I really am not in a position to discuss that.

Senator SCHMITT. You are telling me that the existence or nonexistence of an effort to look at alternatives to the Law of the Sea alternative international regimes is confidential?

Mr. DEDERICK. No; I am not trying to, sir. What I am trying to say is that I am not part of this negotiation process. There is a negotiation process underway.

Senator SCHMITT. But your testimony says Commerce has been participating.

Mr. DEDERICK. Yes; but they are participating in what is an ongoing process which has not reached a conclusion as to what is to be the Government's position. I am not really able to present a position which has not really been decided upon yet and in which I have not participated.

Senator SCHMITT. As part of Public Law 96-479 the Commerce Department completed a study on the critical materials requirements of the U.S. aerospace industry. As you indicated in your testimony, this study make recommendations on improving emergency preparedness, increasing reliability of materials and increasing materials supply options.

Are there any specific actions yet to implement the recommendation?

Mr. DEDERICK. Yes, sir, there are quite a few in various stages of development. Of course, one of the recommendations was to develop an effective stockpile and we have already begun that with the first stockpile purchase in 20 years.

To bring you more up to date, we are instituting improved management techniques to sample and rotate the stockpile materials. We are commissioning an independent review of the quality and the form of the materials to see if they are presently useable. That study is to be done, I believe, in a few months time.

Senator SCHMITT. Are there actual milestones? Is there a plan somewhere in Commerce or somewhere else to which the various agencies are working to insure that these things happen?

Mr. DEDERICK. I hope my associate, Robert Wilson, stops me if I am wrong, but what we are trying to do is to arrange to establish a contract for outside work on this and we are working to establish what precisely should be the form of that right now.

Senator SCHMITT. You mean outside work on developing a plan or what?

Mr. DEDERICK. Well, Bob, why don't you elaborate on that if you would.

Mr. WILSON. When the office was first set up 6 months ago one of the goals was to develop a joint Government/industry program to look at the quality of some of the stockpiled materials because industry had been concerned. We could not offically announce that we were going to appoint a panel of experts, including Government and private sector personnel, to look at the quality of the stockpile until the President's policy statement was released.

Since that time we have received proposals from several groups, including the National Academy of Sciences, the Federation of Materials Society and have talked with the Massachusetts Institute of Technology to develop a statistical sampling technique to look at two or three materials in the stockpile and judge the specifications of the existing material against current specifications.

The end result of the study would be an analysis of the options to upgrade the material. The first effort is a pilot program and we hope to have that finished by the end of 1982 with reports due around January of 1983. At this point in time we have worked with GSA and FEMA in developing this and, as I said, we have received proposals. They have not been exactly what we were looking for.

We had a meeting yesterday on our next step, and that is to convene a meeting of the National Academy of Sciences, the Federation of Materials Society with personnel from FEMA and the Department of Commerce to discuss funding and timetables.

Senator SCHMITT. Pardon me if I shake my head, gentlemen, but the bureaucracy plods on. The industry has indicated that they are willing to do this evaluation. Are we not willing to let them do that? Is there some conflict of interest that you are aware of, some law and ethics or antitrust or something like that that prevents us from allowing the industry to conduct an analysis that they are perfectly capable of doing in our behalf and seem to be willing to do?

Mr. DEDERICK. Well, we are perfectly willing, sir, and anxious to receive an input from them and indeed that is one of the responsibilities of the Office of Strategic Resources.

Senator SCHMITT. What are we afraid of? Why can't we let them organize the assessment if they are willing to do it?

Mr. DEDERICK. Well, I think in the end, sir, we have to make our own decisions.

Senator SCHMITT. I am just asking you what is it that is holding us back from making that decision? What are we afraid of? Are we afraid somebody is going to find out something that it will embarrass the people who used to keep the stockpile? That was another administration.

Mr. DEDERICK. Well, I have certainly not observed it. I do want to, however, be careful that we have all the input that we can, and I want to assure that this is something which we can be satisfied with after it is over. The input from these people is welcomed and indeed sought, but we will have to also have our own independent view.

Now this is just one aspect of course of what we are trying to do. There are many other proposals, but even in this area I haven't mentioned them all. We are trying to develop data on the stockpile restructuring. We are cochairing the review of stockpile quality with FEMA. Another recommendation had to do with strengthening the priorities and allocation system. We have consolidated and simplified some of the regulations and we are sponsoring a number of training sessions to educate defense contractors.

We said that we should give increased foreign policy consideration to mineral supply. Here DOC and other Departments are discussing mineral trade and investment options in various international fora. We have reviewed and revised to some extent our trade policies. In particular, we are supporting foreign mineral development through OPEC and the Exibank.

Senator SCHMITT. Why?

Mr. DEDERICK. Because what we are basically concerned with is that while we are not trying to do something to compete with our industries, we do need to develop alternative sources of supply.

Senator SCHMITT. Are you being selective, or is there any money going into copper development in foreign countries? My copper industry in New Mexico is gone. There is no production except for one mine.

Mr. DEDERICK. I well understand the severity of the problem.

Senator SCHMITT. What about uranium? Are you encouraging uranium development in other countries? Potash? I am just speaking of my State and its imports of those commodities that are now fulfilling a large proportion of the needs of the economy, and then when the economy recovers we will fulfill even more because we will not have an industry prepared to take up the slack. There will be no surge. Why in the world is the Commerce Department now encouraging the development of foreign competitors to the domestic mining industry?

Mr. DEDERICK. Well, what I am talking about really is what the Eximbank is doing in this area, sir. We can supply more information on that for the record.

Senator SCHMITT. You indicated that you were encouraging that, or at least that was the implication I had. Are their trade agreements hurting domestic mining industries? Do you think they are or do you think this is all on balance without effect on domestic mining?

Mr. DEDERICK. Well, the trade area, sir, is the responsibility of the STR and the ITA far more than it is mine, and I would like to consult with my associate, Lionel Olmer, Under Secretary in that area before answering that question.

Senator SCHMITT. The President's plan did not address this issue and I am just curious a little bit why trade was not addressed. Do you know?

Mr. DEDERICK. No, I do not, sir.

Senator SCHMITT. Well, we will have some questions for the record and we appreciate your time.

[The statement follows:]

STATEMENT OF ROBERT G. DEDERICK, ACTING UNDER SECRETARY FOR ECONOMIC AFFAIRS, DEPARTMENT OF COMMERCE

Mr. Chairman and members of the committee: I am pleased to appear before you today to discuss the implementation of the National Materials and Minerals Policy, Research and Development Act of 1980.

In April, President Reagan forwarded his National Materials and Minerals Program Plan and Report to Congress as required by the 1980 Act. The Program Plan sets forth the basic materials and minerals policy of this Administration, which is to decrease U.S. minerals and materials supply vulnerability through actions that promote national security and a healthy economy. To accomplish this end, the report presents broad initiatives in the areas of public lands policy, research and development, data collection and analysis, and strategic stockpile management.

The program has five major features that are consistent with the Administration's overall philosophy.

First, our materials policy places maximum reliance on the marketplace.—This Administration is not attempting to "solve" all the problems of the materials producing and consuming industries. Rather, we are working to build a strong economy and eliminate unnecessary impediments to efficient industrial performance. The revitalization of the minerals and materials industries depends on the revitalization of the entire economy and, therefore, the Materials Program Plan is built upon the industrial incentives contained in the overall economy recovery program. Similarly, the plan to restructure the strategic stockpile will rely primarily on open market purchases and sales.

Second, the policy addresses the entire materials cycle.—Between mining the raw material and its final end use, there are numerous refining, processing, engineering, and manufacturing steps. Problems occur and are resolved at all points in this materials cycle. In recognition of this diversity, the Program Plan was developed by several agencies, including the Department of Interior which is concerned with minerals supply, the Department of Defense which is itself a major consumer of minerals and materials products, and the Department of Commerce which is concerned with materials processing and demand. These various interests are reflected in the Program Plan's recommendations, which range from mining on public lands to research on advanced materials.

Third, the policy recognizes the important relationship of materials to national security.—Improving our mobilization capability is a primary goal of this Administration, and materials preparedness is an important aspect of mobilization. The PROGRAM PLAN includes actions to improve the quantity, quality, and form of the materials in the strategic stockpile, and actions to strengthen stockpike planning and management. It also provides for improving the emergency priorities and allocations system and for the assessment of our defense-related production capabilities.

Fourth, the Program Plan includes long-term as well as short-term initiatives.—The plan is not just a reactive policy dealing with short-term interruptions and relying on the stockpile in times of emergency. Research and development is also an important element in reducing materials supply vulnerability. Advances in minerals and materials processing, durability, performance, conservation, and recycling are critical to improving our industrial competitiveness. The Administration's Economic Recovery Tax Act of 1981 provided important incentives to private sector research and development. In addition, we have given better direction to Government research activities by reactivating the Committee on Materials (COMAT), which reports to the White House Office of Science and Technology Policy (OSTP).

And fifth, implementation of the Program Plan will be a Government-wide initiative.—The Cabinet Council system has proved to be an effective means of developing and implementing policy. The Cabient Council on Natural Resources and the Environment developed the Materials and Minerals Program Plan and will coordinate its implementation. Using the Cabinet Council assures that all interested departments and agencies are represented and precludes the creation of a separate bureaucracy for materials programs.

The 1980 Act requires consideration of national security, economic well-being and industrial production in the implementation of materials and minerals policy. These matters are related to the activities of three Cabinet-level groups:

The Cabinet Council on Natural Resources and Environment,

The Cabinet Council on Economic Affairs, and

The Cabinet Council on Commerce and Trade.

The Secretary of Commerce is a member of the first two Councils and Chairman of the last. In addition, the Department is represented on the President's Emergency Mobilization Preparedness Board. Through those channels, the Department plays a key role in various Federal activities related to the achievement of the Administration's materials and mineral goals.

In general terms, the role of the Department of Commerce is to be responsive to the needs of industry for materials supplies. As a part of these responsibilities, the Department was major participant in the develpment of the Materials Program Plan. DOC chaired working groups which developed recommendation on materials research and development, materials supply and demand analysis, and regulatory reform. The Department of Commerce also prepared a study of "Critical Materials Requirements of the U.S. Aerospace Industry," which concluded that we should take steps to improve emergency preparedness, increase the reliability of raw materials supply, increase the reliability of processed materials supply, and increase materials supply options. Those recommendations are fully consistent with the President's National Materials and Minerals Program Plan, and appropriate actions are underway to implement them.

Within Commerce, we are shifting our focus to implementing the program plan. An Office of Strategic Resources has been established to coordinate the Department's minerals and materials activities. We are focusing attention on strengthening the competitiveness of materials industries and reducing industry vulnerability to supply disruptions of strategic minerals. Among our planned activities are:

Developing an information base and improving end-use analysis through in-depth industry studies as recommended by the 1980 Act. Our follow-up to the aerospace report will evaluate the critical materials requirements of the steel industry. This study will be sent to Congress in early 1983.

Working with the interagency Minerals Information Coordinating Committee to fill important data gaps and to improve Government analysis for policy development. We are particularly interested in developing better information on the regulatory costs of materials industries to assist the overall regulatory reform effort. We are also developing a system for more accurate forecasting of minerals and materials demand.

Addressing industry concerns about emergency preparedness. Together with GSA and FEMA, we are assessing the state of the materials in the national defense stockpile and are instituting better stockpile management techniques. We are continuing to develop basic economic data for stockpile planning, and are consolidating and improving the priorities and allocations system under Title I of the Defense Production Act.

Continuing research and development on substitutes for critical materials in essential uses. The National Bureau of Standards is looking into a variety of innovative engineering materials known as "synterials," including rapidly solidified alloys, high performance ceramics, and composites. DOC is initiating a materials substitution information program; as part of the program an industry workshop on chromium substitution will be conducted in October 1982. We are also investigating the creation of cooperative industrial research and development efforts in particular materials research areas.

Improving the investment climate for seabed mining through the development of seabed mining regulations, the conduct of ocean mining research, negotiation of reciprocal arrangements among seabed mining nations, and participation in the Law of the Sea activities. DOC is also investigating the development of the more accessible mineral resources on the outer continental shelf, including nonmetallics, polymetallic sulfides, and metallic nodules.

Developing a regular industry consultation program with key industry and association representatives. We especially want to be aware of the views of the materials processing and consuming industries to assure that they are adequately presented in the various Cabinet Councils. DOC is also sponsoring industry workshops to assess government and private sector roles in developing materials risk management programs.

In summary, this Administration has a comprehensive Materials and Minerals Program Plan. This Administration has the coordinating mechanisms in place to implement the plan. Now we must concentrate on the implementation phase. The goals of the Administration, and the Congress, are one and the same—to improve the competitiveness of our basic industries and to reduce minerals and materials supply vulnerability in cost effective ways. I thank you for this opportunity to testify and look forward to working with you in addressing these important strategic resources issues.

[The following information was subsequently received for the record:]

QUESTIONS OF THE COMMITTEE AND THE ANSWERS THERETO

Question. If the Administration does not sign the Law of the Sea Treaty, what are the next steps towards establishing, mechanisms for recovering these materials? What mechanisms seem most appropriate to encouraging private sector involvement in seabed minerals recovered.

Answer. In the past, the United States has sought to negotiate a regime for seabed exploitation as part of the Law of Sea Conference, but the final text adopted by the Conference failed to meet the objectives set by the President. As a result, the President has decided that the United States will not sign the Convention as adopted by the Conference. The Departments of State and Commerce are now actively seeking to complete negotiations with other potential ocean mining nations to establish an alternative to the Convention regime through reciprocal recognition of domestic legislation, as provided in Title II of the Deep Seabed Hard Mineral Resources Act. Commerce participation in these negotiations is assigned to the National Oceanic and Atmospheric Administration (NOAA).

For the immediate future, the major obstacles to seabed mineral recovery will be the relatively low profitability and high technical risk of deep ocean mining operations. Over the years, it is expected that projected profits will rise and technical uncertainties will be reduced. NOAA has a number of programs designed to improve the investment climate for seabed mining in this respect, such as its research and surveying activities related to the environmental and technical aspects of deep ocean mining.

Question. Does the Department of Commerce have any immediate plan for reviewing the various factors affecting U.S. competitiveness in the minimg industries and appropriate federal action to increase competitiveness? If so, when will the results of the review be available to the Committee?

Answer. We have no plan for a separate review of the various factors affecting the international competitiveness of domestic mining companies. We do want to point out, however, that the problems of these companies and those who process and use materials were considered carefully in development of the President's National Materials and Minerals Program Plan and Report to Congress of April 5, 1982. As well as the health of those companies, that plan was developed in the context of national security, a healthy economy, American jobs and protection of our natural resources and environment. That plan initiated or reiterated a number of programs helpful to the mining and other basic industries.

Land availability programs will help mining companies directly by providing new avenues for exploration and development consistent with natural resource and environment policies.

The Department of Commerce is playing an active role in the regulatory reform effort through identifying harmful regulations and their impact on business. Many of the modifications now under consideration for the Clean Air Act, the Federal Water Pollution Control Act, and safety and health regulations should be of direct benefit to the mining and materials processing industries. Similarly, the accelerated depreciation, investment tax credit, and tax leasing provisions implemented by the Administration should improve the industries' investment capability.

Government research programs, such as those of the National Bureau of Standards, contribute to the development of new alloying and processing techniques. To make our products more competitive in world markets. Private sector research programs should be stimulated by the new tax incentives, and Government research is to be better coordinated and directed through the revived Committtee on Materials (COMAT).

In regard to trade policy, the International Trade Administration in the Department of Commerce continually seeks to identify and counter unfair trading practices on the part of the foreign competitors of our materials industries through its countervailing duty and antidumping investigations. The Department of Commerce and other agencies are reviewing various trade and investment options with our trading partners in international fora such as the OECD, NATO, GATT, and the individual commodity groups.

In support of the foregoing, the Department of Commerce is participating in an interagency effort to improve minerals data.

Directly or indirectly, each of these activities will help improve the competitiveness of the domestic mining industry.

Question. Will the Department of Commerce investigate in the immediate future the potential and drawbacks for private sector stockpiling to supplement the National Defense Stockpile? If so, when would the results of the investigation be available to the Committee?

Answer. The Department of Commerce has initiated an interagency review of the advantages and disadvantages of private sector stockpiling. This investigation is being conducted under OSR auspices with both government and industry participation so that all viewpoints may be taken into account. A review conference is scheduled for Fall 1982 and the results of the investigation should be available to Congress in early 1983.

This review will supplement the first analysis of private sector stockpiling by the Department of Commerce, which was presented in the study, "Critical Materials Requirements of the U.S. Aerospace Industry." That study discussed two approaches to designing government incentive programs to induce incremental stockholding by industry—the Interest and Carrying Cost Rebate (ICCR) program and the Purchase Cost Rebate Contract (PCRC) program. The current investigation will review these and other types of private stockpiling programs, the current inventory policies of U.S. companies, foreign country stockpiling approaches, and the advantages and disadvantages of private sector stockpiling from both the government and industry viewpoints.

Question. Can you supply for the record what actions have been taken to implement the recommendations of the study, "Critical Materials Requirements of the U.S. Aerospace Industry?"

Answer. The aerospace study, required by the National Materials and Minerals Policy, Research and Development Act of 1980, supplied recommendations for the development of the President's Materials and Minerals Program Plan and Report to

Congress. The recommendations in the aerospace report are essentially the same as those in the President't Program Plan, which is now being implemented as follows:

The development of an effective strategic stockpile is a top Administration priority. The Administration has made the first stockpile purchases in 20 years and is starting to bring the stockpile levels up to goals. The General Services Administration is instituting improved management tecniques to sample and rotate the stockpiled materials. The Department of Commerce and FEMA are commissioning an independent review of the quality and form of stockpiled materials to assess if they are presently usable by industry in an emergency.

The Department of Commerce has consolidated and simplified the regulations for the Priorities and Allocations System to assure materials availability for defense needs. Together with the Department of Defense, we are sponsoring a number of training sessions to eduate defense contractors on using this system.

The Committee on Materials (COMAT) has been revitalized to coordinate and give better direction to Government minerals and materials research programs. COMAT is initiating an inventory of current resesarch activities and is investigat ng cooperative government-industry research and development programs on basic technologies.

The Mineral Information Coordinating Committee has published a computerized directory of all Government minerals data sources. The Committee is now working to identify and remedy gaps in minerals data collection and analysis needed for policy formulation.

The Department of Interior has initiated a number of programs to improve access to public lands for exploration and development of strategic minerals, and has made recommendations on necessary changes to current legislation.

The Vice President's Regulatory Reform Task Force, with the aid of the Department of Commerce and other agencies, is reviewing current and proposed laws and regulations, and has proposed modifications which should reduce any undue regulatory burden on minerals and materials industries.

Senator SCHMITT. I must go vote again. We were hoping to get to Mr. Jim Williams of the Los Alamos Laboratories. I am afraid, Jim, we are just not going to be able to do it. We will put your testimony in the record and I will have a chance to talk with you privately, I am sure, in the not too distant future. We appreciate you coming and it will be most helpful to us.

[The statement follows:]

STATEMENT OF JAMES M. WILLIAMS, ASSISTANT DIRECTOR, PLANNING AND ANALYSIS, LOS ALAMOS NATIONAL LABORATORY

Mr. Chairman, it is a privilege to address this Committee on an issue of vital importance to the Nation's security.

I. INTRODUCTION

The nation is vulnerable to sudden reductions in the availability of many materials widely used in our economy. Sudden supply shortages might not allow time for finding new reserves or developing substitutes, but they will often be accomodated by self-correcting shifts in the market place. However, if these self-correcting shifts do not occur, or if the economy is severely affected by sudden or extended shortages, the economic or even military security of the nation could be endangered. Shortages which occur suddenly and continue for long periods will require long-term solutions such as finding new sources of existing materials or developing substitutes. In these cases, Federally sponsored R&D can play a major role.

Numerous administrative measures can be taken in the near-term to reduce vulnerability. They include: Stockpiling strategic materials to reduce the impact of sudden supply reductions of short-term duration; setting priorities for the use of strategic materials in time of national emergency; planning for the mobilization of domestic industrial capability to mine, mill and refine or to recycle materials which cannot be obtained from alternate sources.

The first two of these measures can help buy time to find alternate solutions to supply disruption problems such as the possibilities of negotiating the restoration of supplies or of developing alternate domestic and international supply channels.

When the limited availability of a strategic material persists over a long period, it is not likely that these administrative measures alone will provide long-term solutions. In the near-term, it will be virtually impossible to predict which materials

will become unavailable for long periods, and we cannot afford to hedge all of our bets. Industrial mobilization could provide a long-term solution for select materials when we know: Where they are, that there are adequate amounts of them available, and how to mine, mill, and refine them.

However, of necessity, industrial mobilization, like other unexercised mobolization programs, suffers from the hazards of having to rely on: 1) an aging and disappearing base of human technical experience, and 2) obsolescent technologies.

Thus, in the near-term it is imperative that we begin to develop additional long-term options. Science and technology can provide some viable long-term solutions.

My testimony today describes, in terms of strategic materials issues: The potential of science and technology to provide long-term solutions, the generic scientific and technical areas that would be the elements in a long-term strategic materials R&D program, and ways to enhance the utilization of the Nation's technology base with emphasis on capabilities residing in DOE National Laboratories.

II. THE POTENTIAL FOR SCIENCE AND TECHNOLOGY TO REDUCE MATERIALS VULNERABILITY

Our Eroding Technology Base and the Role of Federal Laboratories.—An industrial nation cannot afford to become completely dependent on other countries for its basic materials and related technologies. And yet, the United States is in danger of doing just that.

For any number of reasons, including lack of capital, conflicting government regulations, expensive labor, and lack of policy, the technological expertise and/or capability in the United States is declining. It is declining in areas such as: smelting and refining, mining, alloy development, fabrication technology, and research and specialty steels. For example, one copper producer closed its mines and smelters in four locations in Arizona and New Mexico in April of this year. Since 1977, 31 underground mines and 29 open pit mines from which metallic ore was produced have closed down in the U.S. for economic reasons.

Eight smelters have closed just since 1980. Much of our smelting now occurs outside the country. Anaconda Copper Co. closed its smelter in Deer Lodge, Montana, and now ships its ore to Japan for smelting.

We now import milling technology from Sweden, Poland, Japan, and Finland, and mining technology from Germany, U.K., Japan, and Sweden. The chief research area for specialty steels is in Germany.

With these shut-downs comes the loss of technical expertise. Miners, millmen, mining engineers, and geologists can only learn and maintain their skills through practice. There are 175 mining engineers teaching in schools in the U.S.—many nearing retirement age. Currently there are 19 accredited mining or mineral engineering schools, compared with approximately 40 schools producing mining engineers prior to World War II. Extractive metallurgists are extremely scarce.

The preceding paragraphs should ring warning bells. Our industrial technology base in mining and smelting it eroding. These are the very areas in which some long-term solutions to strategic materials problems should be sought. This materials and minerals technology base is a part of the larger and more amorphous science and technology base of this country which represents a vital national asset. Ways should be found to keep the experienced personnel currently leaving the mining and smelting industry within our country's science and technology (S&T) base. If they can practice their expertise in related technologies, the country's long term vulnerability would be reduced. The last few paragraphs of this testimony describe a concept for preserving and productively utilizing this valuable asset.

The S&T base, to which I am referring, is comprised of the people and institutions engaged in the pursuit of basic knowledge and the translation of this knowledge into useful products. It resides in universities, Federal R&D laboratories, and in private industry. These institutions and people represent a national asset which, when focused on problems of national importance, can make innovative advances a reality in the nation's economy and defense establishment. The DOE National Laboratories are a part of the nation's S&T assets.

Maintaining a S&T base fits the role of federal laboratories as described in The President's "National Materials and Minerals Program Plan and Report to Congress" of 5 April 1982

"Any government-financed research and development activities will concentrate on long-term, high-risk, high potential payoff projects with the best chance for wide generic applications to materials problems and increased productivity."

This prescription is also reiterated by the Department of Commerce study on "Critical Materials Requirements of the U.S. Aerospace Industry:"

"The Government should continue its efforts to stimulate private sector research development and should emphasize long-term, high-risk but broadly applicable Government materials research."

Problem-Solving Potential of Science and Technology.—Science and technology (S&T) have the potential to reduce the nation's vulnerability to strategic materials shortages or cutoffs. Generic areas where S&T could assist in reducing the nation's vulnerability and provide long-term solutions to strategic materials problems are:

Resource assessment.—Inventory the natural stockpile of mineral resources on government lands using advanced exploration techniques.

Materials science and technology.—Develop alternative or substitute materials targeted in generic areas which would serve a variety of specific applications.

Advanced process technology.—Develop new and improved methods for mining, drilling, milling, refining and fabricating materials and minerals.

Conservation and recycle.—Develop recycling technology and methods for improved efficiency in the reduction of process-generated scrap.

System analysis.—Develop a capability to provide national program managers with the methodology for making long range assessments of materials supply and demand and the capability of new assessment technologies.

While the technical community can identify generic areas where R&D can have a long-term impact on strategic materials, we can only give examples of what the payoff might be. It is clear from past experience, that where a clear challenge was presented, science and technology is capable of providing innovative solutions to difficult problems. Nonetheless, there exists a general tendency to discount long term R&D where the payoff is not clear.

The urgent need for a comprehensive national program.—A comprehensive, long-term, national program plan is required that would evaluate possible solutions and set objectives and priorities for implementation. Although the planning needs to cover both the short- and long-term, the urgency of beginning such planning and the prompt execution of those plans cannot be over-emphasized. All of the R&D institutions with whom we work recognize that technology is one of a variety of alternatives to assure the supply of our country's materials. Economics, stockpile, foreign policy, legal, and other types of solutions will often be more viable in short-term situations than a technical solution. Long-term solutions must be viewed, interfaced and weighed in both the short- and long-term with other solutions. A comprehensive national program would provide such a view and weigh the alternatives.

III. IMPORTANT ELEMENTS IN A NATIONAL STRATEGIC MATERIALS R&D PROGRAM

The technical capabilities and expertise existing in the national science and technology base which could be utilized in a national strategic materials program can be grouped in five generic technical areas. These are: resource assessment, materials technology and substitution, advanced production technologies, conservation, and system analyses.

These five generic technical R&D areas should be emphasized in solving strategic materials problems. The R&D programs envisioned would be high-risk, long-term research and development projects with broad applications such as those that the President's policy and the Commerce Study in critical aerospace materials prescribe. Problems of mineral and material supply will require much time to solve. It is these generic long-term goals that national laboratories in cooperation with industry and universities would address. The national laboratories would work cooperatively with private, state, and federal institutions and agencies and industry in these areas.

RESOURCE ASSESSMENT

During the National Uranium Resources Evaluation (NURE) Program, several of the national laboratories have developed resource capabilities which are complementary to those existing in the Department of Interior. This capability in advanced exploration technology could be used, for example, in a multi-agency inventory of strategic materials on federal lands. A cooperative program would be a perfect example of the proper use of inter-agency resources with favorable economic returns to the country's taxpayers.

This expertise at the national laboratories is already employed in several general areas of resource assessment: geochemical data acquisition, integration, and interpretation; remote sensing; exploration planning and management; resource characterization; and fundamental generic investigations aimed at explaining the how's and why's of resource concentration. Many years of experience and approximately $250 million of federal expenditures at national laboratories on the NURE and remote sensing programs have resulted in effective techniques which can be utilized

to rapidly identify areas where more complete mineral exploration might be warranted. In addition, experience in characterizing goethermal resources and in developing integrated exploration programs for these resources are also directly applicable to materials and minerals exploration.

Such a program could lead to short-term deliverables such as strategic materials distribution maps, better knowledge of ore genesis and element distributions, and improved exploration techniques. Great Britain and South Africa are actively engaged in their own national resource assessment programs and have already produced geochemical distribution maps. Distribution data by element in the U.S. could lead to the recognition of new areas containing ore deposits, new exploration technologies, and new methods of recovering strategic materials from complex or low-grade ores. In the long-term, more comprehensive and accurate resource assessments could be produced which would allow better long-term planning.

MATERIALS SCIENCE AND TECHNOLOGY

In the area of materials technology and substitution, the laboratories have much experience and have already made significant contributions. Continued materials technology research and development is needed to maintain and upgrade the nation's expertise and capability to manufacture defense related artifacts as well as those used for industrial purposes. Some specific examples of important R&D in this area are:

MATERIALS SUBSTITUTION—METAL ALLOYS

Any nationally integrated R&D program must include an effort to identify the need for substitutes and to develop them. For example, cobalt steels are used where hardness (tool steels, armor-piercing shells), toughness (artillery resistant shield), and high temperature use (turbine blades) are required. A steel with many of these properties has been developed at Los Alamos wherein the cobalt has been replaced with borides and carbides of tungsten, nickel, and iron. Further research in this area should ultimately allow us to find substitutes for the most critical of the alloying metals (cobalt, chromium, and manganese) currently used for specialty steels.

This is a single example. However, future projections are for shortages in nickel, vanadium, and niobium as well as cobalt, chromium, and manganese. The approach which is being used for cobalt steels is of a generic nature, and it may also be applied to those materials for which decreased supplies are forecast. Such a generic R&D program will give our nation an additional set of options when expanded uses and needs of strategic metals outstrip our productive capabilities.

MATERIALS SUBSTITUTION—STRUCTURAL CERAMICS

Structural ceramics also have the potential for replacing strategic metals and alloys with materials of essentially inexhaustible availability. Structural ceramics offer great promise for many energy and defense-related structural material applications since their resistance to high temperatures and hostile environments is generally far superior to high temperture structural metal alloys. A few potential applications are advance gas turbines for vehicles and aircraft, ceramic armor, fusion reactors and high-power, high-temperature fission reactors.

Currently, the most critical problem regarding the application of structural ceramics is that ceramic components with superior properties and microstructures cannot be reliably and reproducibly manufactured. Many are brittle and inadequately resistant to shock. Part of this generic research effort would examine the interrelationships between fabrication, microstructure, and material properties in order to synthesize and develop new structural ceramic materials with superior properties. Activities to date have been concentrated on: SiC and Si_3N_4 ultra-fine/ultra-pure powder production by an RF-plasma/chemical vapor deposition technique, production characterization, and optimization of SiC and Si_3N_4 whiskers. It is felt that the successes achieved thus far are indications that this is a fruitful approach to the ultimate substitution of ceramics for certain of our strategic metals.

LOW GRADE ORES (NONCONVENTIONAL SOURCES OF STRATEGIC MATERIALS)

Past practices of mining only high-grade deposits may have to be modified in cases where deposits no longer exist or are nearing depletion. In the near future, low-grade large-volume, multi-element deposits may have to be exploited to serve our resource needs. These may be non-normal sources such as exposed water-borne sediments, industrial wastes, wastes from fossil fuel extraction and utilization, and municipal wastes.

While there are quantities of needed materials in the potential sources listed above, the generic knowledge and technology base required for a methodical and productive approach to recovery problems need to be developed. A study of chemical methods combined with non-conventional resource evaluation seems to be one course to pursue at this time.

SURFACE STUDIES /CATALYSIS

An expansion of on-going studies in the kinetics of chemical reactions and in catalytic reactions and other surface phenomena area could lead to the development of substitutes for certain critical materials as well as possible improvement in process efficiency. Such research utilizes broad-based support from the types of facilities and capabilities typically available at the national laboratories. As an example of catalytic-reaction research that might have a large payoff, there is evidence that certain uranium and thorium compounds might be efficient catalysts, useful in industry as replacements for platinum-group metal catalysts. Potential applications include catalytic production of synthetic fuels from coal (analogous to the Fischer-Tropsch process), olefin polymerization, and flue-gas desulfurization. The study of uranium and thorium chemistry has been a major programmatic effort at DOE laboratories for decades. Although the emphasis has not been on the catalytic properties of these materials, the DOE laboratories have developed a broad base on which such catalytic studies could build.

ADVANCED PRODUCTION TECHNOLOGIES

In the area of advanced production technologies, generic work should be performed in areas such as: comminution of ores with explosives; innovative drilling technologies; and innovative extractive technologies, such as the new area of biohydrometallurgy.

COMMINUTION

Comminution is any process to reduce the size of particulate materials, such as milling or grinding. In May of 1981 the Materials Advisory Board of the National Academy of Science reported (Document NMAB-364) that annual comminution of approximately one billion tons of ore in the U.S. consumes approximately 2 percent of the national production of electricity and in only approximately 1 percent efficient in increasing the surface area of the ore. High explosives are extensively used in mining operations to produce large rubble for transport to mills and concentrators, where comminution is done mechanically. Very little has been done to investigate the use of explosive comminution of large rubble. Explosive comminution could be cost effective, particularly if done at the mining site, in that the need for mechanical comminution could be reduced or eliminated, more ore per carload could be transported, and a higher surface area could result, thus making concentration and smelting operations more efficient.

INNOVATIVE DRILLING TECHNOLOGIES

Last year, under contract with the national hot dry rock geothermal program, Browing Engineering Corp. demonstrated its capability to drill, by thermal spallation, a 12" hole in granite to depth of 1,000 ft. at rates of 50–100 ft/hr. In conjunction with Browning, a drill bit that will be capable of both spalling and melting rock is being designed and fabricated. This drill bit will also be compatible with a conventional rotary bit. A first demonstration of this conventional/thermal spallation and melting technique is planned for next year.

If the combination of conventional, thermal spallation, and melting techniques is viable, drilling technology would be revolutionized by an order of magnitude reduction in drilling costs. Such cost reductions would facilitate exploration, and the assessment of mineral deposits could be performed by obtaining data acquired at depth. (Today, unless a site has already been deemed to be very promising based on surface data, drilling is not performed, and exploration data at depth has often been unavailable.) Successful innovative drilling techniques could also provide economically viable access to the basement rock which is known to contain tremendous heat and, geoscientists believe, possibly also tremendous mineral resources. Such efforts as innovative drilling and utilization of the basement's resources are ideally suited to a national laboratory where innovative concepts can be explored in conjunction with industry.

CONSERVATION AND RECYCLE

Conservation measures can be applied to reduce the demand for strategic materials. In order to acquire improved conservation technologies, R&D needs to be conducted in areas such as the following: (1) The reduction of scrap from melting, refining, and alloying of operations, (2) Improved material-conservative fabrication operations, (3) Development and optimization of mechanical or automated welding processes, (4) The development and implementation of advanced nondestructive examination techniques, and (5) Recycling of materials from scrap and process effluent streams.

SYSTEM ANALYSIS

Preparing a coherent national plan will require extensive supply and demand analyses, cost benefit tradeoff studies and systems integration assessments in order to formulate a balanced set of objectives and priorities. Four main areas where the laboratories could make substantial systems analysis contributions to strategic materials are in: (1) Assessing the impact of technological advances, (2) Providing specialized supply and demand analyses; (3) Incorporating feedback loops that consider the impact of technology on supply and demand analyses, (4) Utilizing assessments of foreign resources and technology in supply and demand analyses.

The need for weighing the "benefits and costs of alternatives" is expressed in the 3 June 1982 report of the General Accounting Office, "Actions Needed to Promote a Stable Supply of Strategic and Critical Minerals and Materials." In order to weigh the benefits and costs associated with the various national strategies, sophisticated analytical methodologies that are capable of considering the long-term and evaluating the impact of S&T will be required. Such methodologies will require information with a broad national scope for input.

Analytical Methods Required for Planning a National Program.—The recent report by the General Accounting Office describes the analytical methodologies developed and currently used by Interior, FEMA, Lawrence Berkeley Laboratory, GAO, and Office Minerals Policy and Research Analysis. These current methodologies are generally designed to handle short-term assessments of about 3 years. However, three years is too short of a time scale for assessing the potential impact of R&D.

Typical time scales for realizing the payoff from R&D applied to solving identified problems are of the order of 10 years. Basic research typically conducted at universities generally is not aimed at the applied sciences and generally operates on time scales in execess of 10 years. Industry specific R&D generally requires time scales of a least a few years.

Current methodologies also do not include feedback loops that evaluate the impacts of technology or other alternatives and then feed this information back into the supply and demand projections. Methodologies that consider longer time scales and utilize more sophisticated feedback techniques are required of planning activities before the economic, or other impacts, or technology and other long-term alternatives can be properly evaluated.

The main purpose of utilizing analytic methodologies in the national program will be to provide a framework which assures that key decision makers are following a concerted plan of action which most effectively implements the objectives and priorities which they have set.

IV. WAYS TO ENHANCE THE UTILIZATION OF OUR NATIONAL SCIENCE AND TECHNOLOGY CAPABILITIES

Current status.—In general, the science and technology base of the country resides in the amorphous group of institutions and people who practice science and technology. In the past, this community has not been encouraged to focus on the problem of strategic materials, although many individuals have believed the nations should be utilizing our science and technology assets to help solve the problem.

The 1981 report of the Committee on Materials (COMSAT) indicates that about 4 percent of the nation's 1980 federal of $1.1 billion for materials R&D has an indentifiable "end use" of critical & strategic materials. However, about 14 percent of the end uses were acknowledged as being double counted in this report. Today in the DOE laboratories there is, to our knowledge, no funding with the clearly indentified goal of solving strategic or critical materials problems. Therefore, and R&D that may have an "end use" for strategic or critical materials problems is being supported in ongoing R&D programs oriented toward other missions. If R&D is to play a

viable role in providing long-term solution to strategic materials problems, indentified objectives and funding to accomplish those specific objectives will be required.

Conditions required for the effective utilization of national laboratories.—The national laboratories are best suited to generic R&D which spans the gap between the highly goal-oriented and specific research of industry and the long term, basic research of universities. In order to effectively conduct such research requires the stability of broadly defined goals as well as stable long term funding.

The effort required to provide a viable R&D role in strategic materials exceed the capabilities of any one laboratory. It would be a mistake to limit strategic materials R&D efforts to just one or a few laboratories. We must indentify and use the best capabilities from among a variety of university, federal, and industry laboratories. The capabilities of the national laboratories and their contractors must be complementary to and integrated with the efforts of universities, state agencies, and most importantly industry.

In summary, the effective utilization of the science and technology capabilities of the national laboratories will require that:

A cohesive, national program with interagency scope and with a well defined role for R&D exist.

General R&D priorities and goals are defined by a national program, and these goals remain stable for the long term.

Funding is made available specifically for strategic materials R&D.

The funding is allocated according to priorities set by the national program for R&D efforts.

The best capabilities of various laboratories are utilized.

The national program is responsive to the national security needs of the nation and assures cooperation among industry, state, and universities as well as laboratories of the federal agencies.

A strawman national plan.—A major source of vulnerability to this country is the lack of a coherent, integrated national program for strategic materials. The President's "National Materials and Minerals Program Plan and Report to Congress" is a key step in ameliorating this program. However, the preparation of a executable National Program Plan, which sets objectives and priorities for execution is a very important next step.

Our laboratory has been cooperating with the Grand Junction Office, DOE; Bendix Field Engineering Corporation, Idaho Falls Office, DOE; EG&G; and the Jet Propulsion Laboratory, in thinking about strategic materials. Wider cooperation, possibly through the Federal Laboratory Coordination Committee, would enhance communication and provide a more effective approach to such thinking and problem solving. A first result from our joint efforts is in the attached "Implementation Plan for a National Materials & Minerals Policy, Research & Development Program".

This initial effort attempts to conceptualize a well-coordinated, long-term national program in strategic materials. It also identifies where R&D would fit among the other approaches such as stockpiling, foreign policy, etc. Our strawman conceptualizes an organization with sufficient knowledge and authority to formulate policy and to administer or coordinate the programs that implement that policy. It would include organized and coordinated efforts in five major tasks: (1) National managment overview, (2) policy and legislative assessments, (3) critical analyses, (4) supply and demand analyses, and (5) technical investigations. The main contribution of science and technology would be made under the technical investigations task. In this task, efforts would be grouped into the five generic technical areas mentioned previously: resource assessement, materials science and technology, advanced production technology, conservation, and supply and demand analyses.

Short-term efforts that utilize existing technologies should be aimed at alleviating identified high-priority, near-term problems. However, to provide the nation with long-range assessments and solutions, and to allow for change in materials usage and changing technologies, the technical investigations must be considered for the long-term.

TECHNOLOGY ARSENAL

Let me now return to some of my earlier comments regarding the eroding technology base in the mining and smelting industry. We believe that this technology base and the national asset which it represents could be preserved and used through a "technology arsenal" or "technology reserve."

The basic concept of a technology arsenal is that the US would maintain a stockpile of certain critical technologies which could be easily mobilized in time of a national emergency. However, the term stockpile is inappropriate when applied to

technology. Technology must be practiced, must be used, and continually presented with new challenges from which solutions result. Thus, the dynamic "arsenal" rather than stockpile.

In order to establish a technology arsenal, identification would first be made of those key technologies that would be required for the US to achieve material independence, and those technologies in which the US is losing expertise due to its increased reliance on other countries for material supplies.

After this identification, academia, industry, and the laboratories would develop a plan for exercising these critical technologies, and join together to form cadres of technical personnel in the key technical areas. These personnel in a technology arsenal would either work full time or be called-up for a period of time to work in their areas of expertise. Their areas of expertise could be productively utilized in the solution of strategic materials problems such as in the five generic technical areas I previously described.

If such a plan were executed, it could enable our country to productively utilize some technologies that are critical to strategic materials problems and that we are now in jeopardy of losing from our industrial technology base.

Mr. Chairman, I am grateful for the opportunity to present this testimony. In closing I would like to emphasize that Los Alamos National Laboratory and, I am sure, others stand ready to assist in the important strategic material issues and problems facing our nation today.

Attachment.

Implementation Plan for a National Materials and Minerals Policy Program [1]

1. Introduction

It is widely recognized that the United States lacks known domestic resources from which to produce, in the necessary quantities, certain materials and minerals essential to its national security, industrial base, and economic well-being. This situation and the previous lack of an implemented governmental policy have been addressed by the Administration in legislation, either passed or being considered by the Congress.

The Administration, on April 5, 1982, released its "National Materials and Mineral Program Plan and Report to Congress," a report on the activities to be undertaken by the Administration to reduce America's materials vulnerability. The Administration policy is to "decrease America's minerals vulnerability by taking positive action that will promote our national security, help ensure a healthy and vigorous economy, create American jobs, and protect America's natural resources and environment." The Administration's plan broadly addresses several basic areas where problems must be solved as part of a materials and minerals program. These problem areas are: Land availability, collecting minerals data, research and development, regulatory reform, and stockpile policy.

This implementation plan includes an organization for developing a coordinated policy, program, and research and development (R&D) efforts to ensure an adequate and stable supply of materials and minerals for the United States. The organization, strategy, and technological programs needed to address the essential-materials problems are defined. Programs to resolve or alleviate these problems can be implemented rapidly. This plan also addresses some of the requirements of the National Materials and Minerals Policy, Research and Development Act of 1980 (94 STAT. 2305); and it is structured to accommodate the Administration's plan and other legislative initiatives now pending. Appendix A is a summary of public laws that address the strategic materials and minerals situation.

As used in this implementation plan, "essential materials" means materials, including minerals, of current or potential use that are essential to the production of goods and services required for the industrial, military, and civilian needs of the United States. Included are those materials that are primarily imported or for which there is a prospect of shortages or uncertain supply. Also included are those materials which present technological opportunities for the development of new resources, production techniques, material technologies, and means of recycling and conservation. Food and fuels, used as such, are excluded.

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[1] Developed by Grand Junction Area Office, Idaho National Engineering Laboratory, Los Alamos National Laboratory

2. OBJECTIVES

The specific objectives of this implementation plan are to: (1) aid in the development of a national essential materials program; (2) provide an organizational framework by which the program could be conducted; and (3) define the components of that program. This includes further evolution of policy, strengthening essential mineral data collection and analysis, support for R&D, and improved dissemination of related information.

3. STRATEGY

The basic strategy is to establish a managing organization, endowed with sufficient knowledge and authority to formulate, administer, and coordinate programs which implement national policy. This could take the form of a subcommittee of the Cabinet Council on Natural Resources and Environment as prescribed by the Administration's plan. Also required is the continuing participation and cooperation of federal agencies, technical laboratories, state agencies, industry, and universities.

The near-term strategy is to: implement the proposed organization; assess ongoing work which could contribute to solutions or a better understanding of essential-materials problems; strengthens existing activities which would provide near-term results; initiate new activities on currently recognized well-identified problems; and begin work aimed at long-term solutions.

Longer-term strategy is to develop a stable and effective functioning framework for dealing with materials issues. When established, the framwork will provide for:

(1) Formulation and periodic review of national policies (foreign and domestic) relative to essential materials;

(2) National coordination, monitoring, consulting, and planning;

(3) Characterization and periodic review of materials issues including resource assessment, supply and demand, and stockpiling;

(4) Anticipation of new material requirements (usages, technologies, etc.) to forestall the development of supply problems (the need for R&D is emphasized);

(5) Recommendations for the application of available technical solutions and sponsorship of necessary R&D; and

(6) Facilitation of information exchange between government agencies and between government and private sectors.

Based on the information accumulated using this strategy, it will be possible to make well-informed decisions in the areas of federal land administration, regulatory reform, and import and stockpile policy that will assure the United States of an adequate supply of strategic materials and minerals.

4. ORGANIZATION

4.1 Materials and Minerals Coordinating Committee

The Cabinet Council on Natural resources and the Environment is directed by the Administration's plan to provide policy resolution. Because of the diversity and importance of the issues associated with essential materials, a dedicated management team at the highest cabinet level is needed to assure timely, equitable solutions based on a thorough understanding of the available technical, economic, and political alternatives.

It is proposed that a Materials and Minerals Coordinating Committee be formed within the Cabinet Council to direct this program. This Coordinating Committee shall be made up of four members to include the Secretaries (or appropriate Assistant Secretaries) from the Departments of Commerce, Defense, Energy, and Interior. These four departments have extensive existing programs that will be utilized as part of this implemented plan. the Cabinet Council will designate a chairman for this Committee.

The Coordinating Committee will appoint a full-time Executive Director to be chief administrator and program manager. The director will have a staff of 12 full-time employees to assist the Committee. These staff members will be provided by the four departments represented on the Coordinating Committee on 2- to 4-year assignments. Such a full-time staff will provide for continuity of efforts, which are now highly fragmented.

The Chairman of the Coordinating Committee will solicit the support of other federal agencies, state agencies, and industry representatives, through standing and ad hoc committees in carrying out his duties. An important existing working group which will be instrumental in providing information to the Coordinating Committee is the Committee on Materials (COMAT). Under its current charter, COMAT [which reports to the Federal Coordinating Committee on Science, Engineering and Technology (FCCSET)], is charged with an assessment of programs in the federal sector and other issues relating to R&D. Other topics such as foreign policy implications,

land availability, stockpile, economics, legislation, and regulations, will be studied by other committees or groups from appropriate departments.

Representatives from at least the following federal agencies will be requested to participate in staff meetings of the Coordinating Committee:

Central Intelligence Agency, Department of Commerce, Department of Defense, Department of Energy, Department of the Interior, Department of State, Department of the Treasury, Environmental Protection Agency, Federal Emergency Management Agency, National Academy of Science (Materials Advisory Board), National Aeronautics and Space Administration, National Science Foundation, National Security Council, Office of Management and Budget, Office of Science and Technology Policy, and the Office of Technology Assessment.

Representatives from state agencies, industry, and academia will be requested to participate in workshops held by the Coordinating Committee or called upon to consult on specific R&D and/or policy issues. Ad hoc committees will be formed by the Coordinating Committee to study specific R&D and policy issues.

The responsibilities and authority of the Coordinating Committee and the Executive Director are listed in Appendix B.

4.2 Other Federal Departments, Agencies, and Offices

All other federal departments, agencies, and offices with essential-materials-related interests will be involved in an advisory capacity by providing members and information to the Coordinating Committee and ad hoc committees. However, the Coordinating Committee will direct the implementation of the plan by recommending programs and appropriate funding for specific departments. The departments, agencies, and offices, in turn, may carry out their assignments through internal resources, technical laboratories, or contracts.

4.3 Ad Hoc Committees

The committees formed by the Coordinating Committee will report to the Executive Director. These committees shall consist of members from federal agencies, technical labortories, state agencies, academia, and industry. These committees will be responsible for advising the Coordinating Committee on specific technical and policy issues and shall be assigned tasks as the Executive Director deems necessary and appropriate.

As a minimum, committees will be formed to analyze the following essential-materials issues: (1) Domestic policy, (2) foreign policy, (3) legislative recommendations, (4) identification and ranking of essential materials, (5) economic impacts, and (6) evaluation of R&D needs.

4.4 State Agencies

Appropriate state agencies will be asked to provide membership to the committees. They will provide information on various materials, minerals, and related programs, and may be commissioned to execute projects or programs.

4.5 Technical Laboratories for Science and Engineering

Technical laboratories and other selected field offices of the government, in addition to providing membership to the committees, will be utilized as action agents on assigned programs.

4.6 Industry

Industry, individually and through professional associations, will be requested to provide both information and personnel to the Coordinating Committee and other committees, and will be eligible to compete for projects of the National Materials and Mineral Program on a contractual basis.

4.7 Academic Organizations

Knowledgeable academic personnel will be asked to serve on the appropriate committees, and both private and public universities will be commissioned to execute projects of various programs on a contractual basis.

5. Work Scope

This National Materials and Minerals Program is divided into five major program areas: (1) National management overview, (2) policy and legislative recommenda-

tions, (3) supply and demand analysis, (4) criticality analysis, and (5) technical investigations.

Descriptions of the objective and the program activities of each major program area are contained in the following sections.

5.1 *National Management Overview*

5.1.1 *Introduction*

Numerous government and private sector organizations support materials and minerals R&D activities. The actions of government agencies must be coordinated to encourage cross-agency and public/private sector exchange of data and plans. Coordination would also aid in avoiding duplication of effort. While the need for coordination is acknowledged, it is also recognized that R&D is more effective if carries out in closed relationship to the industry or government agency most concerned with the specific application. It is not the intent of this plan to modify that policy.

Similary, domestic and foreign policy and legislative recommendations must be coordinated to meet a wide spectrum of national needs. Therefore, a National Management Overview activity is required to coordinate, monitor, and plan a national policy and R&D effort for essential materials and minerals.

5.1.2 *Objective*

The objective of the National Management Overview Program area is to provide the necessary framework for coordinating, monitoring, planning and executing the National Program.

5.1.3 *Program Activities*

5.1.3.1 Program Management.—The Coordinating Committee will carry out the responsibilities listed above and in Appendix B. Key tasks will be to review and monitor various programs of the federal government that relate to essential materials. Consultation with the states, industry, and other private sector interests will be a continuing process. Thie various program activities will be coordinated to accommodate a coherent essential-materials and minerals policy and R&D program. As part of this program activity, reports providing a domestic inventory of essential resources with projections on the prospective needs of government and industry will be regularly issued.

5.1.3.2. Program and Budget Planning.—Changes in the national and international essential materials situation, and results of R&D programs, will require periodic reassessment of program objectives and specific activities.

In addition, the materials and minerals R&D authorization requests and budgets of all federal agencies and departments will be reviewed annually. The review will be conducted in cooperation with the Executive Office of the President. Recommendations will be made to the Office of Management and Budget to provide the budgets required to conduct a viable national program.

5.2 *Policy and Legislative Recommendations*

5.2.1 *Introduction*

To promote effective and necessary legislation and policy decisions, careful assessment of current laws and policies must be completed. Information from the other program areas will be integrated to assure that policies and proposed legislation are timely, necessary, and effective. This program area will have the responsibility of analyzing existing legislation and policy in light of their original intent and the effect they have on essential-materials supplies. Recommendations will be made based upon domestic and international requirements, political considerations, economic factors, trade agreements, and other factors relating to supplies. These assessments will be continually updated to assure the desired results.

5.2.2. *Objective*

The objectives of the Policy and Legislative Recommendations Program area are: to assess data from the Early Warning System (see 5.3.3.7); to recommend domestic policy, including stockpiling; to recommend foreign policy related to essential materials; and to examine constraints imposed by current law and recommend legislative action.

5.2.3 *Program Activities*

5.2.3.1 Assess Early Warning Data.—After the establishment of an Early Warning System, which will monitor the conditions of the supplies and demands for es-

sential materials, the information from that system will be assessed and used to make policy recommendations. This assessment will assure that appropriate criteria are being used, that the data are received in a timely manner, that shortfalls in supply are being projected, and that legislative and policy organizations are alerted before critical shortages develop.

5.2.3.2 Assess Domestic Policy.—This program activity will review the policies of the governmental bodies which relate to all phases of the materials cycle.

5.2.3.3 Assess Foreign Policy.—U.S. foreign policy initiatives will be recommended in order to encourge cooperative R&D programs and long range trade commitments with other nations and to assure U.S. supplies.

5.2.3.4 Assess Legal Constraints.—The existing federal, state, and local laws and regulations will be reviewed, and effects weighed against the original legislative intent.

5.3 Supply and Demand Analyses

5.3.1 Introduction

A system to provide government and industry with the mechanism required to make long-range assessments of materials supply and demand is necessary. To implement an effective early warning system, detailed reviews of domestic and foreign production capability and utilization will be required. Abundant information exists and will be used to the maximum extent practicable. It will need to be expanded and updated to prepare a sufficiently comprehensive supply analysis. Military and industrial demands will be assessed in detail and integrated with the supply analyses and with the early warning system.

5.3.2 Objectives

The objectives of the Supply and Demand Analyses Program are: to estimate preliminary resource inventories, using data already available; to analyze domestic and foreign production capability; to evaluate industry and military needs; to define economic impacts; to implement an early warning system; and to recommend technical and/or policy approaches to possible solutions.

5.3.3 Program Activities

See Appendix C for a more complete description of these activities.

5.3.3.1 Preliminary Resource Assessment.—Resource information gathered under the Criticality Analysis portion of the program (5.4) will be assembled into a resource data bank, to be updated and reported as new information becomes available. This information will present an up-to-date view of the domestic and foreign reserves and potential resources of each essential mineral.

5.3.3.2 Analyze Domestic Production Capability.—Once the list of essential materials (5.4.3.4) has been established, the current domestic availability of each must be determined as accurately as possible in the context of geologic, technical, economic, and legal/political parameters.

5.3.3.3 Analyze Foreign Production Capability.—Production capabilities from known reserves and estimated potential resources will be projected from the standpoint of existing extraction and processing facilities, or expansion thereof. An analysis similar to the domestic production capability activity will be conducted for the foreign sector.

5.3.3.4 Evaluate Military Needs.—Availability data for specified materials (supplied by the DOD Materials Availability Steering Committee) from the domestic and foreign capability activities will be integrated with demand data in an econometric model to determine whether production capacity is adequate to meet military needs.

5.3.3.5 Evaluate Industry Needs.—An evaluation similiar to the Military Needs activity will be conducted for the industrial sector. A separate task will assess the availability and adequacy of the supply of technically trained personnel for the materials industry.

5.3.3.6 Define Economic Impacts.—The economic implications of essential materials will be evaluated. This evaluation will include analyses of broad generic implications to the overall national economy and specific price and supply/demand considerations for a particular material (see 5.5.3.6.).

5.3.3.7 Implement Early Warning System.—An Early Warning System for essential materials and minerals will be established as a part of emergency contingency planning. The system will provide a warning of potential supply and demand imbalances that would significantly impact the national security of the United States and its economic and social well-being. The types of likely supply interruptions and the effects of drastic price increases and depletion of inventories will be highlighted in the supply, demand, and economic analyses. These analyses, together with analyses

which assess the impact of new technologies, will be integrated into the Early Warning System. The Early Warning System will alert government and industry of significant changes in the status quo and will be closely coordinated with the Essential Materials Information Center (5.4.3.5). The communications will be handled by the Coordinating Committee in conjunction with responsible agencies.

5.4.3.8 Recommend Technical and/or Policy Solutions.—For each identified essential material, an analysis will be performed to determine whether that material is produced domestically in sufficient quantities to meet projected needs. A full range of possible technical and/or policy solutions will be reviewed.

5.4 Criticality Analysis

5.4.1 Introduction

This program area will be closely coordinated with the supply and demand analyses (5.3) and includes a data collection, updating, evaluation and information dissemination. Work in this area will also involve priority ranking of the essential materials to establish the most important factors relating the essential. From these results, solutions to the critical problems can be logically attained.

5.4.2 Objective

The objectives of the Criticality Analysis Program are: to review and evaluate existing information on the supplies and demands of essential materials, collect new information if necessary, rank the materials and technical problems according to the degree of criticality, and establish a center for information exchange and dissemination.

5.4.3 Program Activities

5.4.3.1 Collect Information.—Existing information available in the Departments of Interior, Commerce, and Defense, as well as state government agencies, industry and academia pertain to essential materials will be collected and updated as necessary.

5.4.3.2 Evalute Information.—The information collected for each material from the various agencies will be integrated and evaluated for completeness, consistency and compatibility, and will become the basic information set for use in the determinatiom of the material ranking. Information will be stored in a computerized data bank and updated as appropriate

5.4.3.3 Establish Guidelines for Ranking.—Objective means of evaluating the overall national and international importance of each material will be developed so that the most productive lines of research can be identified and appropriate priorities assigned. Factors to be considered include: (1) Importance to defense, (2) importance to industry and commerce, (3) extent to which the material can be replaced, (4) extent of domestic requirements by usage, (5) extent of domestic resources and supply, (6) dependence on foreign imports, and (7) political stability of foreign import sources.

5.4.3.4 Identify and Rank Materials.—The previously collected and evaluated data will be used to identify and rank essential materials in accordance with the guidelines. Reports will be issued that summarize the work accomplished.

5.4.3.5 Establish Center for Information Exchange.—An Essential Materials Information Center will be established to act as a repository for materials data. It will be the clearing-house for the collection, compilation, and dissemination of data to interested parties (governmental, academic, and private).

5.5 Technical Investigations

5.5.1 Introduction

Advances in science and technology, resulting from investment in R&D, can help alleviate future U.S. essential-materials supply/demand problems directly, by increasing mineral supplies through mineral exploration, mining, processing, and recovery; and indirectly, by aiding conservation of essential materials through advances in minerals and materials processing, design durability, performance, substitution, and recycling. The areas of activities discussed below reflect the Administration's plan, 94 Stat. 2305, and current perceptions of technical work required.

Short-term efforts that utilize existing technologies will be aimed at alleviating identified near-term criticalities. However, to provide the nation with a long-range assessment and problem solving capability, and to allow for dynamics in the materials usage and changing technologies, this program area is basically long-term. It will concentrate on long-term, high risk, high potential payoff projects with the best chance for wide generic application to materials problems and increased productiv-

ity. Mission specific programs of the Department of Defense (DOD) will be given first priority.

5.5.2 Objectives

The objectives of the Technical Investigations Program are to conduct and coordinate federally funded technical investigations in R&D areas and thereby to alleviate essential-materials problems.

5.5.3 Program Activities

5.5.3.1 Analyze and Recommend Technical Tasks.—The technical solutions recommended as a result of the Supply and Demand Analyses and Criticality Analysis will be evaluated and specific R&D tasks will be developed and recommended for program funding. The main R&D areas perceived as providing the required solutions are:

(1) Resource identification and exploration technologies development, (2) production technologies, (3) materials technologies (including stockpile technologies), (4) conservation technologies, and (5) specialized supply and demand analyses.

An R&D work plan will be formulated around these areas and will include: (a) Identification of R&D activities; (b) proposed schedules for the recommended projects, indicating milestones and project durations; (c) the responsible agencies/organizations to coordinate each of the recommended program activities; and (d) a projected total, as well as annual, program cost for that material investigation.

5.5.3.2 Resource Identification and Exploration Technologies.—This program activity will consist of investigations to provide new estimates of domestic resources of each essential material. From these investigations a more accurate inventory of both known reserves and potential resources will evolve. Although geologic deposits are of primary interest, less conventional or less extensive sources such as coal wastes, will also be considered. The tasks in this technical area will utilize the full scope of modern technologies developed by federal agencies and industry. A more detailed description of these tasks is presented in Appendix D.

5.5.3.3 Production Technologies.—Adequate resources of essential materials may be known to exist but may be uneconomical to produce. Such a condition could exist where the grade is too low; where mining costs due to various factors, including excessive depths, size of deposits, geographic location, environmental constraints, or land ownership may be prohibitively high; or where domestic demand is not sufficient to support an extractive complex. Wherever appropriate, R&D programs in advanced mining, milling, refining, and/or advanced extractive ore dressing processes may be undertaken to elevate such deposits to economically feasible or competitive status by reducing constraint costs. Some examples of tasks in this area are presented in Appendix E.

5.5.3.4 Materials Technologies.—For many current applications of essential elements, it is technically feasible to develop materials with lower or no essential-element content, with physical properties equivalent to those of the currently used materials. Some of the more promising activities that should be performed in this area are listed in Appendix F.

5.5.3.5 Conservation Technologies.—The reduction in essential-materials demand which can be realized by the application of conservation measures is highly significant. Additional work to achieve reduction in process-generated scrap, improved design, extended lifetimes, and development of recycling technology will be supported. Some areas for R&D are described in Appendix G.

5.5.3.6 Specialized Supply and Demand Analyses.—In order to weigh the benefits and costs associated with the various national strategies, sophisticated analytical methodologies that are capable of considering the long-term and evaluating the impact of R&D will be required. Some technical developments that will be made to such analyses, which would eventually be incorporated into the Supply and Demand Analyses (5.3) and the Criticality Analysis (5.4), are identified in Appendix H.

6. SCHEDULE

The majority of the initial policy and legislative mechanisms will be established in the early phases of the program. During the first year of the program, organization and lines of communication must be established among federal and state agencies and industry. The staff of the Coordinating Committee will be selected from the various departments of the executive branch. In-depth review will begin in the various departments and agencies of ongoing activities that are or could be related to essential-materials objectives. Near-term goals will be established and work begun to accomplish those goals. In the technical areas, it is envisioned that some short-

term goals will be accomplished (in about three years), particularly in the areas of resource assessment, production technologies, and material technologies.

As the program matures, during the 2- to 5-year period, methodologies and processes for performing the Supply and Demand Analyses and Criticality Analysis will be developed and utilized. The process of utilizing such information for policy and legislative recommendations and management decisions will be developed. Long-term generic R&D activities will be identified and work begun to obtain technical solutions. Thus, the main program development activities will occur in the 2- to 4- or 5-year time period; and the R&D activities and use of the developed methodologies will extend into the long term.

It is anticipated that the national supply and demand of essential materials will change during the years and that the long-term implementation of this national program will have the flexibility to respond to such variable needs.

7. BUDGET

Insufficient information is presently available for providing detailed cost estimates or budget forecasts for this plan. In the first four areas: National Management Overview (5.1), Policy and Legislative Recommendations (5.2), Supply and Demand Analyses (5.3), and Criticality Analysis (5.4), a ramp-up of expenditures is anticipated followed by the development of methodologies and processes in the near-term. Utilization and improvement of these methodologies will occur in the long-term. A preliminary estimate is made of $50 million for a 5-year program, in these four areas. A fraction of this can be considered as presently funded activities, though probably small compared to the R&D activities.

The Technical Investigations (5.5) will comprise, by far, the largest expenditures, and this area is at present the most difficult to estimate. The DOD performed an excellent study of its R&D needs that was presented in testimony before the Senate Subcommittee on Science, Technology, and Space of the Committee on Commerce, Science, and Transportation (H.R. 2743), on June 27 30, July 1 and 2, 1980. It selected four critical materials (beryllium, titanium, cobalt, and chromium) and estimated the time and funding that will be required to develop viable substitution options for these materials. Their multi-year budget estimates totaled $256 million for new work in material science R&D. The DOD testimony recognizes the need for examining several other critical materials in a similar manner.

Estimated budget requirements to meet the goals of the Administration's plan and the intent of 94 Stat. 2305 can be made by the following logic. The annualized new monies required to meet the materials technology R&D goal in the DOD report for four materials are approximately $60 million per year. It appears reasonable to assume that the funding requirements to investigate 8 of the top 20 materials which will be identified in the Criticality Analysis (5.4) would be approximately $120 million per year for the DOD needs in the materials technologies areas. In order to expand these activities to include the needs of the total economy and to include the solutions possible from the other four technology areas [described in Technical Investigations (5.50)], the budget number might approximately double and approach $250 million per year.

These extrapolated estimates are only first approximations, and do not include estimates of ongoing work that could be redirected or reprogrammed to achieve the required goals.

APPENDIX A

PUBLIC LAW SUMMARY

The history of the essential-materials problem is reflected in the twenty or more material- or mineral-policy studies made over the years by government agencies and outside groups, and by the fact that many laws directly or indirectly affect production of nonfuel minerals, their movement in trade and, at times, their subsequent use, and as such constitute aspects of mineral policy.

I. Those laws that deal most directly with essential materials and minerals are reviewed below in chronological order

A. Stockpiling Act of 1939

This Act was the first legislation directed toward the establishment of stockpiles of essential and critical materials for national defense. It also authorized exploration and development of domestic resources by the Department of the Interior.

B. Stockpiling Act of 1946

The legislative intent of this Act was to promote the acquisition of essential materials for a national stockpile through direct purchases, transfers of war surpluses, procurement through use of foreign counterpart funds from foreign aid programs, and barter of U.S. surplus agricultural commodities.

The second major purpose of the 1946 Act was to encourage development of sources of those materials within the U.S. by providing that the Secretary of the Interior, through the Directors of the Bureau of Mines and the Geological Survey, was authorized to "make scientific, technologic, and economic investigations concerning extent and mode of occurrence, development, mining, preparation, treatment, and utilization of ores and other mineral substances" that are found in the U.S. and its territories or insular possessions, and which are essential for defense or industrial needs.

C. Defense Production Act of 1950

Title I of this Act, in response to the Korean War, provided specific authority for priorities and allocations. Title III of the Act provided broad authority for increasing materials supplies. Specifically, it provided for: loans or loan guarantees for exploration, development, and mining of essential or critical materials; purchases of or commitments to purchase metals, minerals, and other materials; encouragement of exploration, development, and mining of essential and critical materials; and the development of substitutes for essential and critical materials.

This Act is primary to the legislative history and future of essential materials. It has been amended greatly over the years (each amendment is a Public Law), and is due for a definitive review this year as stipulated in the National Materials and Minerals Policy Research and Development Act of 1980.

D. Mining and Minerals Policy Act of 1970

The purpose of this Act was to establish, for the first time, a ". . . broad, overall national minerals policy with particular emphasis on the need for an economically sound and stable mining and minerals industry." The Act is quite short and is basically a statement of principles and fundamental objectives. The responsibility for implementing the statement therein was to be that of the Secretary of the Interior.

E. Strategic and Critical Materials Stockpiling Revision Act of 1979

This Act reaffirms the need for stockpiling, conservation, and development of national resources. It specifies that the purpose of the stockpile is for national defense only, and is not to be used for economic or budgetary purposes.

F. National Materials and Minerals Policy Research and Development Act of 1980

This Act requires the President, in accordance with the provisions and requirements of the Mining and Minerals Policy Act of 1970, to submit a plan to implement a national policy. In addition, the Act recommends that the President shall coordinate the responsible Departments and Agencies and shall:

". . . support basic and applied R&D to provide for (A) advanced technology for the exploration, discovery, and determination of nonfuel materials, (B) enhanced methods and processes for the use of renewable resources, (C) improved methods for the extraction, processing, recovery, and recycle of material which encourages the conservation of materials, energy, and the environment, and (D) improved understanding of new and current materials performance, processing, substitution, and adaptablility in engineering designs; . . . assess the need for technically trained personnel necessary for materials research and problem solving (A) by private corporations performing the same or related activities in materials industries and (B) by Federal and State institutions having shared interests or objectives."

II. Current Status of New Legislation

A. H.R. 3364, Representative Santini et al.

This Bill attempts to remove barriers preventing pursuit of the recommendations made in the National Materials and Minerals Policy Research and Development Act of 1980. The purposes of the Bill are:

". . .to encourage the development of economically sound and stable domestic mining, minerals, and materials industries, to encourage the orderly development of domestic mineral and material resources, to increase accessibility of public lands for mineral exploration and development, to strengthen mineral data collection and analysis, and, to promote and encourage R&D of technology for substitution, recycling, and conservation of essential minerals and materials."

Of particular interest for the purposes of this plan are these points: the Bureau of Mines is designated the principal federal agency for the handling of mineral data; the Bill provides for several types of land-use evaluations, including re-evaluation of all land-use plans developed under the Federal Land Policy and Management Act of 1976; the Bill mandates an inventory of lands withdrawn, restricted, or closed to mineral location and of lands made available for mineral location under this Act; the Bill requires the Secretary of the Interior to review lands nominated by any persons to determine suitability for mineral location or leasing; and it extends the December 31, 1983, mining expiration date in the Wilderness Act to December 31, 1983.

This Bill is currently the subject of hearings in the Committee on Interior and Insular Affairs (October 29, 1981). It is also scheduled for hearings in the Committees on Ways and Means, Judiciary, Armed Services, and Foreign Affairs.

B. H.R. 4281. Representative Fuqua et al.

This Bill is referred to as the "Critical Materials Act of 1981." It establishes a three-member Council on Critical Materials and products rather than on mines and minerals as proposed by the Santini Bill The Bill describes the Council and its responsibilities and authorities.

It is possible that this Bill might be combined with the Santini Bill.

C. S. 1982. Senator Schmitt et al.

This Bill, called the "Strategic Stockpile Reforms Act of 1981," has been submitted by one of the nation's leading proponents of a comprehensive strategic materials program. It would consolidate the stockpile-related functions of the General Services Administration and the Federal Emergency Management Agency into a Strategic Stockpile Commission. This new structure is intended to improve efficiency in managing the stockpile. The Bill; is pending in the Senate Committee on Armed Services.

Appendix B

Responsibilities and Authority of Coordinating Committee

The responsibilities and authority of the Coordinating Committee and the Executive Director are listed below:

I. Responsibilities

The responsibilities of the Coordinating Committee are:

A. To assist and advise the Cabinet Council in establishing a coherent national materials policy consistent with other Federal policies, and in carrying out activities necessary to implement such a policy;

B. To coordinate Federal materials-related policies, programs, and R&D activities related to essential materials;

C. To review and appraise the various programs and activities of the federal government in accordance with the policy and directions given in 94 STAT.2305 and to determine the extent to which such programs and activities are contributing to the achievement of such policy and directions;

D. To formulate and recommend to the Cabinet Council, national policies designed to improve conditions affecting the essential minerals and materials needs and resources of the U.S., and to meet its social, economic, and national security goals;

E. To advise the Cabinet Council of minerals and materials trends (including early warning information), both domestic and foreign, the implications thereof to United States and world economies and to national security, and the probable effects of such trends on domestic industries;

F. To make or furnish such studies, analyses, reports, and recommendations with respect to matters of materials-related policy and legislation as the Cabinet Council may request;

G. To review annually the materials R&D authorization requests and budgets of all Federal agencies and departments. In this activity the Coordinating Committee shall, in cooperatioin with the Office of Science and Technology Policy, the Office of Management and Budget, and other Federal offices and agencies deemed approriate, ensure close coordination of the goals and directions of such programs with the policies as determined by the Coordinating Committee; and

H. To assist the Office of Science and Technology Policy in the preparation of such long-range materials assessments and reports as may be required by 94 STAT.2305, and assist other Federal entities in the preparation of analyses and reporting related to essential materials.

The responsibilities of the Executive Director of the Coordinating Committee staff are:

A. To direct the professional and administrative staff and support for the Coordinating Committee and to implement its directives;

B. To assist the Federal agencies and departments in appraising the effectiveness of existing and proposed facilities, programs, policies, and activities of the Federal government, including R&D, which affect essential-materials availability and needs;

C. To catalog, monitor, and evaluate the essential materials and materials-related R&D needs of the private and public sectors;

D. To initiate government and private studies and analyses designed to advance knowledge of essential-materials issues and develop alternatives, including R&D, to resolve national essential-materials problems;

E. To issue periodic reports providing a domestic inventory of essential resources with projections on the prospective needs of government and industry for these resources. This report will include a long-range assessment, prepared in conjunction with the Office of Science and Technology Policy in accordance with 94 STAT.2305 and in conjunction with such other government departments or agencies as may be considered necessary, of the prospective major essential materials problems which the United States is likely to confront in the near future and indicate how these problems may best be addressed.

F. To recommend to the Cabinet Council such changes in the current policies, activities, and regulations of the Federal government, and such legislation, as may be considered necessary, to carry out the intent of 94 STAT.2305.

II. Authority

In carrying out the responsibilities assigned above, the Coordinating Committee shall have the authority to:

A. Establish standing and ad hoc committees consisting of Federal, State, academic, and industry representatives as appropriate;

B. Formulate and periodically update this national plan for execution by selected Federal, State, academic, or industrial organizations;

C. Prescribe such rules and regulations, as may be necessary for its operation;

D. Enter into contractrs and acquire property necessary for its operation;

E. Request available information from private and public sources, and

F. Publich or arrange to publish nonproprietary essential materials information that it deems useful to the public and to private industry.

The Executive Director of the Coordinating Committee staff shall have the authority to:

A. Direct a staff not to exceed 12 employees on rotating asignment from government agencies to carry out the staff responsibilities;

B. Obtain the services of consultants in accordance with appropriate Federal regulations; and

C. Develop rules and regulations necessary to carry out 94 STAT.2305 and other relevant legislation.

APPENDIX C

DETAILED TASKS FOR SUPPLY AND DEMAND ANALYSES (5.3)

I. Objectives

Detailed tasks support the following objectives:

A. Evaluate the extent of domestic self-sufficiency in meeting future requirements for critical materials, anticipating the effects of changing resource availability, technology, and international markets. Determine the associated costs.

B. Develop an early warning system to alert the Cabinet Council and other government officials of potential materials problems before they occur.

C. Analyze strategic-minerals options, such as resource development, minerals substitution, stockpiling, and new technology, considering the trade-off implications in terms of cost, time, and feasibility.

II. Preliminary Resource Assessment

A. Assemble a natural resource data base to include data on geographic, geologic, and physical characteristics, as well as grade-tonnage distributions, of all known and projected deposits of each strategic mineral.

B. Estimate potential resources for each material in this data base.

C. Reevaluate assessments of all material for which inadequate resources are estimated.

III. Analyze Domestic Production Capability

A. Examine production capabilities in terms of existing reserves, potential resources, and extraction, processing, refining, fabrication, and transportation facilities.

B. Postulate hypothetical and/or expanded facilities on the basis of current or planned technology, estimating appropriate lead times for the development of new mineral deposits and/or new or expanded facility construction.

C. Calculate production costs (capital and operating), production economics, and availability of capital for timely development of the required resources.

D. Project future supply under various demand scenarios based on the estimated capability for future production using the "production center" concept.

E. Characterize the distribution of strategic materials from the "production centers" to the various demand centers: industry, military, and social.

F. Estimate the limiting effects of local, regional, national and international noneconomic constraints on the production and movement of each strategic material.

IV. Analyze Foreign Production Capability

A. Repeat Task III at the international level.

B. Analyze the opportunities to promote cooperative agreements with foreign producers, thereby increasing the reliability of material supplies to the United States.

V. Evaluate Military Needs

A. Construct an econometric model using availability data integrated with demand data to determine if production capacity is sufficient to meet military needs.

B. Examine imbalances of supply and demand, describing in detail the nature and magnitudes of these imbalances and their principal causes, whether they be economic or noneconomic.

C. Prepare a report assessing the availability and adequacy of supply of technically trained personnel necessary for the proper conduct of defense-related materials programs.

D. Consider the effects of international agreements, stockpiling, conservation, commodity dumping or hoarding, and pricing policies on demand by the military.

E. Assess periodically the adequacy of the national stockpile to meet strategic requirements.

VI. Evaluate Industry Needs

A. Repeat Task V for the industrial sector.

B. Assess the availability and adequacy of supply of technically trained personnel for industry-related materials programs.

VII. Define Economic Impacts

A. Examine the availability of capital for resource development, construction of new facilities, and expansion of existing production facilities, and new technologies development in light of current and projected market conditions, economic indicators, investment risk, community appeal, and tax structure (investment tax credits, depreciation and depletion allowance) at the national and international level.

B. Evaluate the impact on the national economy, using the results from Task A above, as well as assumptions about inflation, cost escalation, and the floor prices of the selected minerals.

C. Perform an international economic analysis using data gathered in Task A in order to measure the effects of bartering, trade balances, balance of payments, competition, optimum resource allocation, and foreign investments in the United States.

VIII. Implement Early Warning System

A. Operate a system designed to alert the government to any potential supply/demand imbalance that would result from embargoes, drastic price increases, and depletion of inventories, which would significantly impact the national security of the United States and its economic and social well-being.

IX. Recommend Technical and/or Policy Solutions

A. Analyze each essential material to determine the specific reasons that the material is not found or produced domestically in sufficient quantities to meet projected needs.

B. Prepare reports as needed which suggest specific technical and/or policy solutions, including stockpiling, that should be implemented to mitigate actual or potential shortages.

Appendix D

Resource Identification and Exploration Technologies (5.5.3.2)

An accurate inventory of the domestic reserves and potential resources or each essential material is requisite to an effective materials R&D program.

Advanced exploration and resource extraction technologies were developed during the DOE's National Uranium Resources Evaluation (NURE) Program when more than one million water and stream sediment samples were collected throughout the U.S., including Alaska. The inventory conducted by several of the national laboratories provided an improved assessment of national uranium resources available for nuclear power generation and also delineated areas of the U.S. favorable for uranium exploration. In addition to uranium, the water and sediment samples were analyzed for up to 43 additional elements, including most of the strategic materials. In spite of its enormity, this amount of information can be successfully integrated with geophysical, geochemical, and satellite data surface maps and known resources by using sophisticated computer technologies.

This multi-element information, gathered during the geochemical surveys, represents a national data base that provides baseline geochemical information for a variety of studies. A program is underway to integrate the large amounts of these geochemical data with other large geologic and geophysical data bases to devise a systematic methdology to assess the potential for locating strategic mineral deposits throughout the U.S. The development of regional geochemical atlases of essential resources are possible with data already in existence and the available advanced data-integration technology.

The NURE approach could be used in a multi-agency inventory of stategic materials. We envision the extensive NURE data base and DOE's ability to integrate data bases by computer to be utilized in a manner that would indicate potential areas for further field exploration by the U.S. Geological Survey. Such an approach for locating new resources has already been shown to be feasible in test cases. A cooperative multi-agency program that utilizes the newest technologies available would constitute a proper use of interagency resources and reflect economic stewardship of U.S tax dollars.

Strategic materials distribution maps based on available data and preliminary assessment of selected natural resources are near-term (approximately three years) goals. During this period, high-potential areas for field exploration would be sought. In the long term (approximately five years), comprehensive resource assessments with field work could be produced. Proposed tasks for resource identification are detailed below.

I. Compile Existing Data and Select Recognition Criteria

A. Develop a classification of occurrences for each commodity.
B. Select, develop, and analyze control areas for each occurrence class.
C. Develop recognition criteria for each occurrence class.
D. Develop exploration models for each occurrence class.
E. Extend assessment to include foreign resource occurrence data, if desired.

II. Select Target Areas

A. Obtain input from experts on U.S. areas analogous to occurrences described above.
B. Screen and analyze existing geological, geophysical, and geochemical data to identify target areas.
C. Evaluate and assign priorities to selected target areas.
D. Determine need for additional data for each target area.

III. Collect and Analyze New Data for Target Areas

A. Conduct geochemical and/or geophysical surveys.
B. Interpret new survey data.
C. Perform geologic evaluations for target area.

IV. Assess Resource Potential of Target Areas

A. Elicit data necessary to calculate resource potential.
B. Calculate endowment for each target area.

V. Conduct Supporting Technology Development Projects

Technology development projects will be planned and conducted to support new exploration needs identified during the above tasks.

Appendix E

Production Technologies (5.5.3.3)

Tasks in the production technologies with potential for R&D include the areas of innovative drilling technologies, comminution, beneficiation, rock mechanics, in-situ recovery, and automated sorting of pegmatites. For examples, successful innovative drilling methods, such as combined conventional/thermal spallation and melting techniques could provide economically viable access to the basement rock which is known to contain tremendous heat and, geoscientists believe, possibly also tremendous mineral resources.

Comminution is a process by which mineral ores and other materials are reduced by crushing and grinding to sizes required for beneficiation in which the severed components are separated into concentrated and tailing products. R&D efforts could be concentrated on many aspects of this process. Research areas could include comminution by high explosives.

Beneficiation research could include chemical processes for the recovery and reduction of essential materials from ores and waste streams. This requires basic chemical research in catalysis, ion exchange, and membrane chemistry. High temperature extractive processes require chemical research in slags, electrowinning, and plasmas to advance technology and promote economical recovery and refinement with minimal material loss. Biological processes, both leaching and sorption, would require research into the mechanisms by which the biological processes operate and into improving the characteristics of organisms.

In the area of rock mechanics, costs of underground mining are inherently high. These high costs can be exacerbated by unusual conditions, including unstable ground and excessive groundwater. Research into ground support systems or into the general subject of rock-mechanics should lead the way ultimately to less costly methods of recovering such deposits.

In-situ recovery pertains to those mineral deposits that are known to exist but cannot be mined because of their low quality, excessive depth, and unstable rock conditions. Research into economically and environmentally sound in-situ methods of "leaching" deposits, which are currently exploitable, could result in significant improvements.

The development of a process for the automated sorting of strategic minerals or metals from pegmatites would encourage the evolution of a viable domestic pegmatite mining industry in the United States by enabling it to compete more successfully with foreign sources. Techniques in this process that may merit research include the development of guidance mechanisms, size sorters, shape sorters, and resonance ionization spectroscopy.

Appendix F

Materials Technologies (5.5.3.4)

For many current applications of essential elements, it is technically feasible to develop materials with lower or no essential-element content with properties equivalent to those of the currently used materials. This can be accomplished by development of new metallic and nonmetallic materials based on nonessential elements and treatments (coating, surface modification, etc.) to existing materials to achieve the desired properties. Research in low-element utilization is suggested in alloy, composite, and ceramic development, and in surface treatments, joining processes, and fracture tests.

I. Alloys

A. Techniques based on more readily available alloying elements (e.g., Fe-Al-Mn alloy system, Mo Ni-rich stainless steels, and alloys strengthened by intermetallic compounds).

B. Rapid solidification technology (high strength and oxidation resistance).

C. Powder metallurgy techniques for synthesizing new alloys by minimizing or preventing extensive segregation.

D. Alternative alloys to those containing essential metals. Extensive testing to establish a data base permitting their use where applicable and certifying their compliance with code requirements, such as the ASME Boiler and Pressure Vesel Code. New alloys that could repalce conventional alloys require testing.

II. Composites

A. Organic composites in low-temperature applications.

B. Metal/metal, metal/ceramic, and graphite/graphite composites in high-temperature applications.

III. Ceramics

A. Replacement for essential materials in both bulk and surface coating forms.
B. Enhanced durability ceramics for superalloy replacement.
C. Spinels, fosterite, and dolomite as potential replacements for chromium-dependent refractories.

IV. Surface Treatments

A. Ion implantation.
B. Rapid solidification (laser glazing).
C. Surface hromium diffusion.
D. Chemical vapor deposition and electroplating in conjunction with laser glazing.
E. Treatments reducing environmental degradation.
F. Treatments using base metals with low essential-material content, retaining high resistance to wear, corrosion, and oxidation.

V. Joining Processes

A. Processes for joining sections with treated surfaces and protective coatings that do not affect the surface characteristics of the coatings.
B. Nonweld bonding systems.

VI. Fracture Tests

A. Fracture toughness of new alloys and the effects of weld joints and thermal exposures on fracture toughness.
B. Fracture mechanics techniques to quantify environmental effects (stress-corrosion, hydrogen embrittlement, liquid-metal embrittlement, fatigue, and corrosion fatigue) on structure reliability.

VII. Stockpile Technologies

A. Develop required methods of analysis and reprocessing.
B. Develop required management systems.

Appendix G

Conservation Technologies (5.5.3.5)

Conservation of essential materials can be achieved through advances in minerals and materials processing, design, durability, performance, substitution, and recycling. Processes that utilize known techniques, preserve existing resources, eliminate waste, and recycle materials are included in these technical investigations. For example, rock wastes comprise an enormous, unassessed, partially processed, strategic-element resource. Other industrial effluents also contain large quantities of recoverable strategic elements. These drainages and solutions may contain a number of elements in quantities large enough to satisfy a substantial fraction of the nation's needs if they could be recovered. Existing conservation technologies can be enhanced through R&D in the following areas.

I. Process Technology

A. Slag chemistry.
B. Plasma melting, electroslag refining, arc melting.
C. Melting methods that permit use of contaminated scrap.
D. In-process detection and early removal of defects to minimize scrap losses.
E. Improved metal-working equipment (rod and bar mills).
F. Ingot process changes (continuous casting, near-net-shape casting) to reduce need for breakdown.

II. Fabrication Operations

A. Chipless machining.
B. Investment and slush casting.
C. Hot isostatic processing.
D. Zero-draft and isothermal forging.
E. Superplasticity.

III. Improved Weld Processes

A. Mechanical or automated weld processes that permit the use of narrow-gap weld designs and reduce filler metals during welding.
B. High-energy-beam autogenous weld processes.

C. Decreased weld-repair frequency and subsequent component rejection.

D. Substitution of welded components for machined and mechanically fastened components.

IV. Nondestructive Examination Techniques

A. High-temperature techniques that detect defects during hot working.

B. Sensitivity techniques for detecting, locating, and sizing defects during hot working, which would encourage design innovation, promote lighter structures, and extend useful structural lifetimes.

C. Techniques for determining material strength and toughness.

D. Engineering design techniques and practices, possibly computer-supported, that optimize strength-to-weight ratios, extend useful lifetimes, and minimize design conservatism.

V. Recycling

A. New refining processes for reclaiming scarce alloying elements from superalloy scrap and minimizing introduction of impurities from service-related contamination.

B. New process technologies and improved alloy selection and design criteria to reduce residual buildup resulting from extensive recycling.

C. Techniques for recovery of essential materials from process-effluent streams.

D. Trace element recovery from rock waste drainages, particularly from coal mining.

Seven elements identified in the drainages from coal have been designated "long-term supply problem minerals" and are imported in large quantities. New methods are needed to extract trace elements that exist in low concentration in energy-related rock, mineral, and industrial waste drainages, and utilize them as a mineral resource. Relatively inexpensive research would (1) provide a quantitative assessment of the mineral content of wastes and effluents, and (2) develop the techniques needed to identify the types and amounts of these elements that can be recovered, along with the processes to perform the extraction.

Appendix H

SPECIALIZED SUPPLY AND DEMAND ANALYSIS (5.5.3.6)

Preparing a coherent national plan will require extensive supply and demand analysis, cost benefit trade-off studies, and systems integration assessments to formulate a balanced set of objectives and priorities. Four main areas where technical contributions could make substantial systems analysis contributions to strategic materials are in: 1) assessing the impact of technological advances, 2) providing specialized supply and demand analyses; 3) incorporating feedback loops that consider the impact of technology on supply and demand analyses, 4) providing assessments of foreign resources and technology in supply and demand analyses.

[The following information was subsequently received for the record:]

Questions of the Committee and the Answers Thereto

RELATIONSHIP OF LANL ACTIVITIES TO COMAT

Question. How would the activities which LANL proposed to conduct relate to those of COMAT?

Answer. First, I would like to emphasize that my testimony represents ideas regarding a national R&D program that would be required to obtain solutions to our country's strategic materials problems. In particular, this testimony emphasizes the technical efforts and solutions that would be possible through the efforts of national laboratories and industrial laboratories. The efforts described would require the efforts of many laboratories and industry.

In the past, Committee on Materials (COMAT), has been primarily devoted to interagency coordination in the area of materials science research and development (R&D). Such communication has proved to be highly valuable. However, strategic materials R&D is required in other areas in addition to materials sciences. Two key elements are missing from the past role of COMAT and are unclear in its role as envisioned in the President's Report to Congress:

(1) All of the technological areas where strategic materials R&D could be beneficial, are not adequately represented, and

(2) There is no decision making, budgetary, or implementation authority in the COMAT charter which can assure R&D priorities are established.

Despite these missing elements, COMAT can continue to be effective in providing for interagency communications. Los Alamos and other DOE laboratories should continue to participate in these communication exchanges through the DOE representative on COMAT.

R&D ON MINING TECHNOLOGIES

Question. Can you describe in some detail the types of R&D on mining technologies that could help the domestic mining industry?

Answer. We have thought of six areas that R&D can directly help the mining industry. Examples of potential R&D in each are as follows:

1. Innovative drilling technologies

Last year, under contract with the national Hot Dry Rock Geothermal Program, Browning Engineering Corporation demonstrated its capability to drill, by thermal spallation, a 12" hole in granite to a depth of 1000 ft. at rates of 50–100 ft/hr. In conjunction with Browning, a drill bit that will be capable of both spalling and melting rock is being designed and fabricated. This drill bit will also be compatible with a conventional rotary bit. A first demonstration of this conventional/thermal spallation and melting technique is planned for next year.

If this combination of conventional, thermal spallation, and melting techniques is viable, drilling technology could be improved by as much as an order of magnitude reduction in drilling costs. Such cost reductions would facilitate exploration, and the assessment of mineral deposits could be performed by obtaining data acquired at depth.

Today, unless a site has already been deemed to be very promising based on surface data, drilling is not performed, and exploration data at depth has often been unavailable. Successful innovative drilling techniques could also provide economically viable access to the basement rock which is known to contain tremendous heat and, geoscientists believe, possibly also tremendous mineral resources. Such efforts as innovative drilling and utilization of the basement's resources are ideally suited to a national laboratory where innovative concepts can be explored in conjunction with industry.

2. Comminution

Comminution is a single or multistage process by which mineral ores and other materials are reduced by crushing and grinding to those sizes required for beneficiation, in which the severed components are separated into concentrate and tailing products. On the order of a billion tons of rock ore alone is crushed and ground every year in the United States. In May 1981, the Committee on Communication and Energy of the National Materials Advisory Board (NMAB) reported that annual communication of approximately one billions tons of ore in the U.S. consumes approximately 2% of the national production of electricity and is only approximately 1% efficient in increasing the surface area of the ore (Document NMAB–364).

The NMAB report discusses the current state of the art in various topic areas of comminution and a series of recommendations related to each topic is presented. The areas for improvement are divided into six groups: (1) Comminution Device Design; (2) Classifier Device Design; (3) Control; (4) Grinding Additions; (5) Materials; and (6) Education and Training. Within each of these six groups a set of project areas is identified involving specific efforts that are required to achieve or that will contribute to the achievement of the overall objective. The national laboratories have technical capabilities in a variety of the topical areas that could be utilized in these six topic areas to achieve improved energy in comminution processes.

In particular, the laboratories have considerable expertise in the use and design of chemical explosives and their effects in various environments. Presently, high explosives are extensively used in mining operations to produce large rubble for transport to smelters and refineries, where comminution is done mechanically. Very little R&D has been done to investigate the further size reduction of large rubble through use of explosive comminution. Explosive comminution could be highly cost effective, particularly if done at the mining site, in that the need for mechanical comminution could be reduced or eliminated, more ore per carload could be transported, and a higher surface area could result, thus making concentration and smelting operations more efficient.

3. Rock mechanics

Costs of underground mining are inherently high. These high costs can be exacerbated by unusual conditions including unstable ground and excessive groundwater. Research into ground support systems or into the general subject of rock-mechanics should lead the way ultimately to less costly methods of recovering such deposits. This is a long-range high risk, high potential payoff type of research.

The report of the United States National Committee for Rock Mechanics is a review of the type of research being undertaken in this area.

It identifies these major research areas:

The development of improved methods for determining in situ stresses, particularly on a regional scale and at high pressures and temperatures;

The development of methods for detecting discontinuities remotely, for analyzing them in three dimensions, and for determining their effects on the hydraulic and mechanical properties of rock masses;

Studies of rock fracture, particularly fracture propagation resulting from explosives, mechanical forces, and fluid pressures;

The development of in situ techniques for the measurement of the hydraulic properties of discontinuities, especially in rocks of very low permeability and porosity and at high pressures and temperatures;

The development of numerical models to handle realistic problems including three dimensions, large strains, fracture propagation, instability, and the effects of discontinuities, as well as the coupling of simultaneous effects of thermomechanical, fluid-flow, and thermochemical processes;

Improved understanding, through laboratory and field studies, of the thermochemical, thermomechanical, and thermophysical properties of rocks;

The resolution of the disparities that appear to exist between the results of laboratory and field tests, of the effects of scale on rock properties, and of methods for the in situ measurement of the properties of rock masses.

4. In-Situ recovery

Numerous mineral deposits are known to exist but cannot be mined because of their low quality, excessive depth, and unstable rock conditions. In situ processes have been developed and practiced for recovery of various materials including salt, potash, oxide copper and uranium. Long range research into economically and environmentally sound in situ methods of "leaching" deposits which are currently exploitable, could result in significant improvements.

In particular, capabilities might be developed for producing massive underground fracture systems, determining the location and extent of such fracture systems, and controlling the flow of fluids through these fractures. Such capabilities are currently being developed by the DOE hot dry rock geothermal program, conducted by Los Alamos National Laboratory.[1]

5. Automated Sorting of Pegmatities

The development of a process for the automated sorting of strategic minerals of metals such as niobium, tantalum, beryllium, cesium, and lithium from pegmatities would encourage the evolution of a viable domestic pegmatite mining industry in the United States by enabling it to compete more successfully with foreign sources. The tonnage of recoverable reserves of these critical materials available at various metal prices would increase significantly by using these improved ore dressing techniques. Also the likelihood of extant modern operations which could be expanded to make up much of the differential lost when foreign supplies were unavailable would be enhanced.

New techniques which may merit research include:

(a) A self-learning optical scanning system whereby output from an optical sensor is analyzed using a microprocessor which maintains the data base as a reference.

(b) An x-ray fluorescence system combined with air jets, trapdoors, or other guidance mechanisms.

(c) A beryllometer: ^{9}Be (γ, n) ^{8}Be.

(d) Size sorters.

(e) Shape sorters used in diamond recovery.

(f) Ferrosilicon density separation whereby the density of water slurry is increased permitting sink-float separation at a specific gravity of about 3.

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[1] Some years ago, Kennecott and Los Alamos Laborator were planning to exchange staff members in order to work on technoligies such as those mentioned above which are common to both hot dry rock and copper leaching. The subsequent cut backs in Kennecott's Arizona operations prohibited this joint venture.

(g) Ferro- and paramagnetism.
(h) Resonance ionization spectroscopy.

6. Resource assessment

The location of new resources for potential future mining operations could aid the domestic mining industry. The types of R&D based on currently available data and computer technologies that could be performed in this area are described in some detail in both my testimony and the enclosed strawman implementation plan.

Senator SCHMITT. Thank you.

The hearing is recessed.

[Whereupon, at 4:50 p.m., the hearing adjourned, subject to the call of the Chair.]

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ADDITIONAL ARTICLES, LETTERS, AND STATEMENTS

STATEMENT OF AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.

The Aerospace Industries Association of America, Inc. (AIA), representing the nation's major manufacturers of aircraft, aircraft engines, missiles and related high technology components and equipment appreciates this opportunity to comment on President Reagan's National Materials and Minerals Program Plan and Report to Congress. Two years ago, AIA appeared before this Subcommittee to testify in support of H.R. 2743, which was subsequently signed into law as the National Materials and Minerals Policy, Research and Development Act of 1980. The provisions of that legislation require the preparation and submission of the subject policy statement, and this document represents the first attempt by the United States to address the materials issue in a comprehensive and coordinated manner.

The aerospace industry has long been concerned with the degree to which the United States is foreign source dependent on numerous metal and mineral resources. Today there is virtually no domestic production of seven key materials needed for the production of aircraft; consequently, such materials must be imported in quantities of ninety percent or more. Among those materials are chromium, cobalt, tantalum and columbium. The extent of such foreign source dependency, disturbing in and to itself, becomes more alarming when one assesses the handful of countries in possession of these resources. Unfortunately for the United States, a number of these countries are neither economically nor politically stable, and this unpredictability poses the constant threat of foreign supply disruption. Therefore, it is imperative that the United States formulate a carefully thought-out, integrated materials policy to achieve and maintain an adequate and stable supply of these important resources.

In this respect, the Administration's recently released policy statement represents a significant milestone in the effort to identify the materials problems confronting the United States and the actions necessary to reduce our vulnerability to supply cutoffs. In general, the following major points in the Administration's statement should be supported:

A National Defense Stockpile containing materials in sufficient quantities and of appropriate grade, form and quality, organized and managed in such a manner as to reduce our vulnerability to foreign supply cutoffs of materials which are normally imported, and which are crucial to national economic stability and security.

Identification of domestic resources and the continued search for technologies which would eventually allow these resources to be produced in an economically and environmentally acceptable manner.

Support for R&D which can lead to substitution alternatives and conservation and recycling methodology in the future.

Increased focus on national materials and resource issues through government awareness and action.

We do, however, perceive some weaknesses in the policy statement as presented. Principally, there is no adequate explanation of how the broad policies described therein will be carried out; additional definition by the Administration is needed. Further, there are certain areas which are not addressed by the Plan. While the proposed stockpile policy is a step forward, it does not go far enough. The quality, grade, form and quantity of stockpile inventories, while important facets of the overall stockpile problem, are overshadowed in the long run by the need for an effective stockpile organizational structure. S. 1982, Senator Harrison Schmitt's proposal for an independent Strategic Stockpile Commission with sole responsibility for stockpile policy, management and administration will provide a more rational, coherent organizational scheme for effective operation of the stockpile.

Additionally, the policy statement does not deal with the question of access to the national stockpile during periods of crisis similar to the one which occurred in 1978 when the Zairian cobalt supply was seriously threatened by that country's internal strife. Such a situation, falling short of national conflict, can nonetheless inflict serious harm on the aerospace industry, the American economy as a whole and our de-

fense preparedness. Mechanisms to address such unanticipated threats of supply disruptions must be developed and incorporated into a stockpile use policy.

Permanent high level visibility and responsibility for a national materials policy is vital. While the present Administration's use of the Cabinet Council format is effective, we would favor the establishment of a permanent body which would be required by law to handle materials and minerals policy; such a formally constituted entity would assure continued attention. In this respect, Representative Don Fuqua has introduced legislation (H.R. 4281) which could provide an appropriate, permanent authority.

The President's policy statement should be applauded for its recognition of the importance of materials availability to our national security and defense preparedness, and its commitment to developing a thorough and comprehensive framework for addressing the problems associated with extremely limited domestic sources of strategic and critical materials. Successfully managing the long term problem of materials and minerals dependency will require long-term strategies, and the aerospace industry will continue to support and encourage government efforts to formulate programs and policies that incorporate such strategies.

Materials Research and Development—Estimated Expenditures by Selected Agencies Related to Stockpiled Materials [1]

The table below is derived from data obtained by a telephone survey of the 23 selected agencies listed. The people shown in the supporting data as contacts are either the agency director or a knowledgeable staff member, where the director was unavailable for comment. Of necessity, some of the informaton developed is qualitative, not quantitative. The purpose of the survey was to collect estimates and knowledgeable opinions of the amount of funding in each agency for materials research specifically intended to affect, or reasonably expected to affect, the consumption or production of the materials for which the National Defense Stockpile is maintained. The first column, which measures intent to affect, assumes no limit in the period of time over which the effect may be seen. The second column, which measures the expectation of an effect, is limited to expenditures whose effects are expected to occur within five years of the current expenditure. In six cases, the word "some" appears in the second column, and in one case the word "moderate" appears. In these cases, the effects intended from the expenditures listed in the first column are expected to occur within five years, in "some" or "moderate" amount; it is not implied that projects or funding additional to the funding shown in the first column have been identified. For the Naval Material Command, the 180,000 in the second column in included in the 1.2 million of the first column. "Expected to affect" means expected to affect positively, i.e., expected to reduce the consumption of, or increase the secure production of, those materials for which the stockpile is maintained.

TABLE 1.—MATERIALS RESEARCH DEVELOPMENT DEVELOPMENT; ESTIMATED EXPENDITURES BY ELECTED SELECTED AGENCIES, WHERE AN EFFECT ON STOCKPILE ON STOCKPILED MATERIALS CONSUMPTION OR PRODUCTION IS INTENDED, OR REASONABLY EXPECTED IN 5 YEARS—FISCAL YEAR 1982

[Dollars]

Agency	Estimated funding [1]	Estimated funding [2]
Agriculture Department		
Agricultural Research Service	1,000,000	Some
Cooperative Research Service	650,000	Some
Forest Products and Engineering Research	0	0
Air Force Office of Scientific Research—Chemical and Atmospheric Sciences	0	0
Army Materials and Mechanics Research Center	0	3,000,000
Army Research Office		
Physics Division	0	0
Metallurgy and Materials Science Division	175,000	Some
Chemistry Division	0	0

[1] Sorce: David B. Hack, analyst, energy technology, Science Policy Research Division, CRS, Library of Congress.

TABLE 1.—MATERIALS RESEARCH DEVELOPMENT DEVELOPMENT, ESTIMATED EXPENDITURES BY ELECTED SELECTED AGENCIES, WHERE AN EFFECT ON STOCKPILE ON STOCKPILED MATERIALS CONSUMPTION OR PRODUCTION IS INTENDED, OR REASONABLY EXPECTED IN 5 YEARS—FISCAL YEAR 1982—Continued

[Dollars]

Agency	Estimated funding [1]	Estimated funding [2]
Electronics Division	0	0
Commerce Department, Maritime Administration	0	0
Commerce Department NBS, Center for Materials Science	2,800,000	Moderate
Defense Advanced Research Projects Agency, Defense Sciences Office	Some	Some
Energy Department	0	0
Interior Department	200,000	Some
Federal Emergency Management Agency	40,000	Some
NASA, Office of Aeronautics and Space Technology	0	200,000
NASA, Office of Terrestrial Applications, Materials Processing in Space Division	0	0
National Institute of Dental Research, Restorative Materials Program Branch	0	0
NSF, Division of Materials Research	0	500,000-1,000,000
NSF, Division of Chemical and Process Engineering	2,000,000	0
Navy		
Navy Material Command	1,200,000	180,000
Office of Naval Research, Mathematical and Physical Science Directorate	0	0
Office of Naval Research, Engineering Sciences Directorate	600,000	0

[1] With specific intent to affect consumption or production of stockpiled materials, no time limit.
[2] Which may have effect on consumption or production of stockpiled materials in 5 years.

AGRICULTURE DEPARTMENT—AGRICULTURAL RESEARCH SERVICE

Intent to affect the stockpile: $1 million for guayule rubber research.
Possible positive effect on the stockpile in five years: "some."
Contacts: Joe Garbarino, 447-2991/Kathryn Davenport, 447-3414.

AGRICULURE DEPARTMENT—COOPERATIVE RESEARCH SERVICE

Intent to the stockpile: $650,000 for guayule rubber research.
Possible positive effect on the stockpile in five years: "some."
Contact: Dr. Clarence Grogan, 447-6195.

AGRICULTURE DEPARTMENT—FOREST PRODUCTS AND ENGINEERING RESEARCH

Intent to affect the stockpile: "none." Some research on recycling of municipal trash; the motive is extension of the paper pulp resource, but the subject includes possible recovery of non-wood-based materials. Some work on environmental aspects of mining in the National Forests; the connection is to increased supplies of minerals.

Possible positive effect on the stockpile in five years: Connection is "very slight;" in time of emergency, wood can be substituted for other construction materials such as steel, reducing the demand for alloying metals which may be required for steel manufacture. However, the metals used in steel for construction are not so critical as those used in engines and armor.

Contact: Dave Johnson/John Erickson, 447-5653.

AIR FORCE OFFICE OF SCIENTIFIC RESEARCH—CHEMICAL AND ATMOSPHERIC SCIENCES

Intent to affect the stockpile: "none." Programs in composites, polymergraphite advanced concepts, molecular composites, ceramic composites with ceramic fiber and glass fiber. Growing emphasis on surface chemistry, electronic functional fluids, hydraulic fluids, thin film electronics.

Possible positive effect on the stockpile in five years: "none." Programs are just as likely to generate an increased rather than a decreased stockpile demand. The objectives are performance, cost and reliability—mission objectives, not stockpile objectives. Some work on ways to retire components *for cause* through non-destructive evaluation, rather than retirement at the end of a nominal service lifetime.

Contact: Donald L. Ball, 767-4960.

ARMY MATERIALS AND MECHANICS RESEARCH CENTER

Intent to affect the stockpile: "none."

Possible positive effect on the stockpile in five years: about $3 million, or 15 percent of the technology base program. Another $7 million might have an effect over longer periods.

Contacts: Dr. E. S. Wright/Richard Shea, (617) 923-5275/5742.

ARMY RESEARCH OFFICE—PHYSICS DIVISION

Intent to affect the stockpile: "none."

Possible positive effect on the stockpile in five years: "none."

Contact: C. Boghosian, (919) 549-0641.

ARMY RESEARCH OFFICE—METALLURGY AND MATERIALS SCIENCE DIVISION

Intent to affect the stockplie: "some." Have funded a workshop on chromium for $10,000 out of a $5,000,000 budget. Have three programs of $50-60,000 each in high-temperature ceramics for turbine engines, and refractory coatings for high temperature environments.

Possible positive effect on stockpile in five years: "some limited." Mostly basic research. Don't have a program in strategic and critical materials; working on guidelines. Working on subject of metal coatings in place of bulk metal. Have started a program on aspects of polymer concrete, as a substitute for some chromium-containing alloys. Main thrust: what materials can you substitute without damaging the economy in an emergency? Trying to set up an industrial review group for technology transfer to industry.

Contacts: G. Mayer/Bob Rieber, (919) 549-0641

ARMY RESEARCH OFFICE—CHEMISTRY DIVISION

Intent to affect stockpile: "none." Focus is on analytical chemistry. The ultimate tie-in would be in terms of performance characteristics of military value not stockpile objectives.

Possible positive impact on stockpile in five years: "none."

Contact: R. Ghirardelli, (919) 549-0641.

ARMY RESEARCH OFFICE—ELECTRONICS DIVISION

Intent to affect stockpile: "none." Research generates demands for materials, not supplies. Possible positive impact on stockpile in five years: "none." Contact: H (919) 549-0641.

COMMERCE DEPARTMENT—MARITIME ADMINISTRATION

Intent to affect the stockpile: "none." Program is directed to two purposes only: to improve performance of ships, or to improve productivity of the shipbuilding industry.

Possible positive effect on the stockpile: "none."

COMMERCE DEPARTMENT (NATIONL BUREAU OF STANDARDS)—CENTER FOR MATERIALS SCIENCE

Intent to affect the stockpile: "some." The program is not intended to affect critical materials, except for $2.8 million in Commerce Department funds, and $2.3 million in other agency funds, in programs affecting chromium, titanium, nickel, niobium, manganese and tantalm. For these six metals, the intent of the program is both to increase productivity in the industrial base, and to develop alternate materials technologies, through programs in metallurgy, polymers, composites and ceramics.

Possible positive effect on the stockpile in five years: "moderate" effect in five years. "substantial" effect in ten years, from the above programs. Any effects from other programs would be indirect and speculative.

Contacts: John B. Wachtman, Jr./Bruce Steinger, 928-1000, extension 2891.

DEFENSE ADVANCED RESEARCH PROJECTS AGENCY—DEFENSE SCIENCE OFFICE

Intent to affect the stockpile: "some, in 10-15 years." Critical materials are, however, not the primary purpose of the program. The program is primarily aimed at higher performance alloys, unusual alloys to compete with titanium. There are indi-

cations of some unusual aluminum alloys which may be competitive with titanium alloys on a density-corrected basis. Currently have under study some new nickel-based superalloys containing no cobalt.

Possible positive effect on the stockpile in five years: "some," possible near-term potential for high-temperature aluminum alloys.

Contacts: Edward C. Van Reuth, 694-4750/Lt. Col. Carl Jacobson, 694-1346.

ENERGY DEPARTMENT

Intent to affect stockpile: "none." The specific intent is to build a better, or cheaper, or more efficient energy conversion device, not to affect supply or demand for stockpiled materials.

Possible positive effect on stockpile in five years: "none."

Contact: Louis Ianniello, 353-3427.

INTERIOR DEPARTMENT

Intent to affect stockpile: "some." A $200,000 program for domestic substitutes for refractory grade bauxite. (Completed a program on recycling of chromium alloys; final reports issued.) Looking at new sources of lower-grade ores available domestically: chromium, cobalt, platinum.

DPossaible positive impact on stockpile in five years: "some."

Contact: Charles B. Kenahan, 634-1263.

FEDERAL EMERGENCY MANAGEMENT AGENCY

Intent to affect the stockpile: "some." About $40-50,000 each year is given to the National Materials Advisory Board to conduct studies. Examples, FY 1982: Identify bottlenecks in the domestic titanium industry; trends in supply and usage of columbium and tatalum. Most of FEMA's work is in the forecasting and preparedness aspects of managing the stockpile itself, however.

Possible positive impact on the stockpile in five years: "some." In the middle 1970s FEMA funded some research projects, through the Defense Production Act, on recovery of metals from stainless steels, and to find substitutes for stainless steel. No funding for this now.

Contact: Robert Mroczek, 287-3935.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION: [NASA]—OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY

Intent to affect the stockpile: "Very, very little to do with the National Defense Stockpile." Exception: one program of about $1 million per year at NASA-Lewis, involving research on cobalt-containing alloys to understand what the cobalt does. The project is called COSAM (consumption of strategic materials) and was started about a year ago; the current focus is cobalt. Have already found one material which does well with about half as much cobalt.

Possible positive effect on the stockpile in five years: Substantial program in turbine engines, with no intention to affect stockpile, but it *may* affect the stockpile. Involves tungsten fiber reinforcement of superalloys, and high-temperature oxide-dispersion-strengthened materials. Each program is of magnitude perhaps $100,000.

Contacts: Leonard A. Harris/Charlie Bersch, 755-3264.

NASA—OFFICE OF TERRESTRIAL APPLICATIONS, MATERIALS PROCESSING IN SPACE DIVISION

Intent to affect stockpile: "none."

Possible positive effect on stockpile in five years: "none." "We're doing basic research, you never knowq what may come of it."

Contacts: Louis R. Testardi/Dr. Oran, 755-2070.

NATIONAL INSTITUTES OF HEALTH—NATIONAL INSTITUTE OF DENTAL RESEARCH, RESTORATIVE MATERIALS PROGRAM BRANCH

Intent to affect stockpile: "none." Program is based on other criteria; does not address the availability of materials. Research in prosthodontic materials which contain titanium cobalt, chromium, nickel and molybdenum. The focus however is on alternatives to gold, because of the last decade's increase in the price of gold.

Possible positive effect on the stockpile in five years: "Difficult to say." There is a growing interest in base metals in prosthodontics. Some concern about "what will we turn to if gold is too expensive and other alloys not available."

Contact: Thomas M. Velega, Ph. D., 496-7492.

NATIONAL SCIENCE FOUNDATION—DIVISION OF MATERIALS RESEARCH

Intent to affect stockpile: "about zero."

Possible positive effect on stockpile in five years: "some." "We support mostly long-range basic research, not materials substitution, per se. We have a research subtopic called 'materials of high import dependence'." Total expenditures that could have a long-run effect on materials substitution, about $500,000-$1,000,000.

Contact: Dr. Wilcox, 357-9789.

NATIONAL SCIENCE FOUNDATION—DIVISION OF CHEMICAL AND PROCESS ENGINEERING

Intent to affect stockpile: "100 percent." The program is not geared to any prioritized problems. NSF is not a mission agency. Individual research projects which could contribute to more efficient and economic extraction of materials of stratetgic value: FY 1982, about $1.73 million, FY 1983, about $2.1 million. The entire program is focused toward mineral beneficiation.

Possible positive impact on stockpile in five yeares: "none."

Contact: Dr. Mukherjee, 357-9606.

NAVY, NAVAL MATERIAL COMMAND

Intent to affect the stockpile: $200,000 guayule rubber prototype; $100,000 study effort for domestic materials substitutes for critical materials; $175,000 conservation and cost reduction (processes to recycle columbium powder and high pressure castings ingots); $700,000 for materials development related to beryllium, cobalt, and mica.

Possible positive effect on the stockpile in five years: about 15 percent of above numbers ($180,000).

Contacts: James J. Kelly/Mr. Spaulding, 696-4731.

NAVY, OFFICE OF NAVAL RESEARCH—MATHEMATICAL AND PHYSICAL SCIENCE DIRECTORATE

Intent to affect the stockpile: "none."

Possible positive effect on the stockpile in five years: "very small." Just as likely to increase demands for stockpiled materials as reduce them. "Looking for special properties; e.g., composites in place of titanium, but it is not the titanium which guides us." The guiding principles are cost reduction, maintainability, etc.

Contact: William Condell, 696-4212.

NAVY, OFFICE OF NAVAL RESEARCH—ENGINEERING SCIENCES DIRECTORATE

Intent to affect the stockpile: "some." Concerned about critical materials from the point of view of substitution (e.g. cobalt or chromium). Focus is on specific opportunities. Example: permanent magnets; basic research on long-term, no-cobalt applications of intermediate-power magnets. About $400,000 per year on magnets, out of a total budget of $13 million for the materials division. One contract for $120,000 on metal alloys for oxidation/corrosion resistance: e.g., iron/aluminum alloys to replace chromium. Altogether, about $600,000 in both FY 1982 and 1983.

Possible positive effect on stockpile in five years: "none."

Contact: Don Polk, 696-4401.

TRW INC.,
Cleveland, Ohio, June 22, 1982.

Hon. HARRISON H. SCHMITT,
Chairman, Subcommittee on Science, Technology, and Space, Senate Committee on Commerce, Science, and Transportation, Russell Senate Office Building, Washington, D.C.

DEAR MR. CHAIRMAN AND MEMBERS OF THE SUBCOMMITTEE: I appreciate your invitation to provide my views on the President's National Materials and Minerals Plan and Report to Congress, recently submitted in accordance with Section 5(a) of P.L. 96-479, The National Materials and Minerals Policy, Research and Development Act of 1980. While I regret that a longstanding, high priority speaking engagement precluded my personal appearance before you to respond to your questions, this submission for your hearings record is intended to be comprehensive.

To be most responsive to the interests of the Committee regarding utilization of our science and technology to reduce U.S. Materials vulnerabilities, I have divided my testimony into three subjects; namely, (1) perceptions on the nature and seriousness of the strategic materials and minerals issues, (2) the potential of science and technology to reduce our vulnerability, and (3) ways to enhance the utilization of our scientific and technological capabilities.

PERCEPTIONS OF THE NATURE AND SERIOUSNESS OF THE STRATEGIC MATERIALS AND MINERALS ISSUES

Much has been written recently about whether or not the United States and the rest of the free world is in a resource war with the Soviet Union for those critical non-fuel minerals essential to our industrial base. Furthermore enough has been written on our import dependence for these materials that it should be clear by now to every citizen that (1) the world's mineral resources are not equitably distributed over the face of the Earth, (2) nor is it economically feasible for the United States to be totally self-sufficient in domestic resources for all key minerals, and (3) that the disciplines of risk analysis and risk management are essential if we are to delineate between undue vulnerability and manageable dependency.

As an illustration of my point, and to provide "real world" background for my subsequent comments about the national minerals program, I will describe a partial risk analysis conducted about two years ago by TRW. That analysis revealed that nearly one-third of the company's purchasing volume of supplies and materials for 1980 contained critical materials, resulting in a dependency ratio of sales revenues to procurement costs of nearly 7 to 1. A summary of some of the important defense and civilian products manufactured by TRW which use those strategic elements for which the United States is over 90 percent import dependent is as follows:

A. Cobalt.—industrial drills and end mills, threading tools, carbide tools, nuclear reactor control rod drives, and jet engine turbine blades.

B. Tantalum.—cutting tools, resistors, capacitors, electronic switches and contacts, and jet engine turbine blades.

C. Chromium.—engine valves for a wide variety of automotive, agricultural and other engines; nuclear reactor control rod drives; transportation hydraulic drives and steering components; petroleum production pumps, drill bits, jet engine casings and jet engine turbine blades and compressor components.

D. Columbium.—cutting tools.

E. Platinium-group metals.—electrical resistors and connectors.

Self-evidently, these products in turn are essential to a broad slice of the U.S. manufacturing base.

TRW's risk analysis revealed the need for long-range resource planning coupled with strategic business planning to guide management decisions throughout the company. This planning includes identifying major issues, establishing objectives based upon these issues, determining specific strategies for achieving those objectives, and allocating resources needed to implement the strategies—all based upon certain key operating assumptions as to the seriousness of risks which a responsibile company must either avoid or successfully manage. These operating assumptions are:

A. The high percentage import reliance of the United States for chromium, cobalt, tantalum, columbium and platinum-group metals will continue out to the turn of the century and beyond.

B. The demand for most of these materials will increase at an annual rate of 2 to 3 percent to the year 2000.

C. Domestic mining production, scrap recycling, and secondary recovery of tailings will probably supply only 10-15 percent of the U.S. demand for these materials under the best of potential circumstances, short of large-scale seabed manganese nodule mining, dramatic technological breakthroughs, or a long-term supply cutoff which could marshall investment in domestic production.

D. The price of these materials will be highly susceptible to temporary supply disruptions, unreasonable price hikes, preemptive market manipulations and source-nation political instabilities.

E. Supplier countries will continue to invest in processing technology and capacity in order to benefit from the value added by refined materials, alloys and mill forms. This trend will have the following major impacts:

(1) It will further displace the head end of our defense industrial base offshore;

(2) It will make those parts of our Strategic Stockpile which are in the form of unprocessed or semi-processed materials even more obsolete than they are

today, since there will be neither the lead time nor the domestic capacity to convert these raw or semi-processed materials into the necessary defense production forms; and

(3) It will place more economic leveraging into the hands of the supplier countries; hence, prices of such materials will continue to seek new levels as indicated by supply control, speculation, and preemptive market maneuvers.

F. International competitors to the U.S. will aggressively pursue a number of policies to secure their supplies of critical materials, to include:

(1) Geographically diversifying their sources of imports;

(2) Acquiring direct production and distribution rights; and

(3) Strengthening their relationships with resource-rich nations by supplying needed technology, production equipment, food and other forms of economic aid.

G. The Soviet Union will continue to wage a resource war with the Western Alliance, since that will

(1) Put pressure on our allies to choose between the U.S.S.R.'s long-term resources (or control of resources) and the U.S. short term stockpile, and

(2) Provide a long-term hedge against decreasing resources in the U.S.S.R. relative to South Africa for platinum-group metals, vanadium, manganese and chromium.

In the face of these disturbing and challenging risks there is a great deal that TRW, or any company can do in developing strategies for critical and strategic materials, to include planning, procurement, and technical strategies. For the purpose of this hearing I will outline some of the potential technology strategies that TRW, a large multinational materials user company, is considering and implementing to reduce our dependence on strategic material, all of which can be extrapolated to federal program objectives and strategies. We recognize that there are differing views as to the actual severity or immediacy of some of the risks which I have outlined, but prudence dictates "taking out insurance" even when the odds of total cutoff are very low—but when the consequences of being a low-odds "casualty" are drastic.

THE POTENTIAL OF SCIENCE AND TECHNOLOGY TO REDUCE OUR MATERIALS VULNERABILITY

Materials substitution, replacement and conservation have become active fields of scientific and technical enquiry. For the sake of brevity, I will describe in outline format some of the technical strategies being implemented by TRW. These strategies are divided into the following categories: (a) substitution and "displacement", (b) conservation through design and processing, (c) reclamation, and (d) life extension.

A. Substitution and Displacement

(1) In cooperation with customers and suppliers evaluate the properties of new alloys containing reduced strategic material content.

(2) Develop fabrication and processing methods to enhance the properties of such alloys to meet performance requirements.

(3) Explore the use of advanced materials which will substitute for or displace the overall need for strategic materials. These include:

(a) Composite materials (e.g., metals, polymers or glasses reinforced with graphite, glass, ceramic and polyimide fibers);

(b) Rapidly solidified metals;

(c) Structural ceramics (especially those "toughened" by internal discontinuities);

(d) Intermetallic compounds (and alloys strengthened by intermetallic compounds);

(e) Structural polymers;

(f) Coated-graphite and woven-graphite composites and laminates;

(g) Advanced coatings, ion implants, laminates, claddings, graded layers, or dual-composition concepts which reduce the total requirements for critical materials.

B. Conservation Through Design and Processing

(1) Use computerized methods for product design as well as for control of manufacturing to minimize excessive use of strategic materials

(2) Exploit manufacturing techniques which produce parts to near-net shape, thereby reducing metal removal operations and scrap generation, such as:

(a) Investment and precision die casting;

(b) Powder Metallurgy;

(c) Precision stepped extrusions and forgings;
(d) Improved welding and joining techniques;
(e) Superplastic forming, isothermal and near-isothermal forging and hot- (and in some cases cold-) isostatic pressing.

C. Reclamation

(1) Assess current technology and devise procedures for rapid identification and sorting of scrap metals
(2) Reclaim mechanically-cleanable materials, such as shop floor scrap, grinding swarf, and chemical machining sludges
(3) Identify and track scrap through all stages of manufacture and collection to maintain pedigree, and
(4) Develop advanced extractive technologies to minimize the buildup of deleterious trace elements in recycled scrap and for producing master melt alloys from contaminated wastes.

D. Life Extension

(1) Employ computer-aided design, manufacture and inspection techniques to improve structural integrity, reliability, and resistance to failure.
(2) Use improved coatings, alloys and microstructures (e.g., through rapid solidification metallurgy) to minimize wear, erosion and corrosion.
(3) Develop improved nondestructive evaluation, analytical, repair, maintenance, in-service monitoring and rework procedures to extend the life of existing structures and components containing strategic materials.

From the foregoing, TRW has discovered that there are clear and immediate actions that are driven by economic, defensive, and opportunistic incentives which do not need to await government action or policy intervention. By applying these technical strategies, we have already achieved some successes in reducing our dependence on strategic materials, and other developments are in the wings. Examples include the following: (1) advanced coatings for industrial tools which not only extend tool life but may permit reducing the content of strategic alloy elements, (2) base metals which replace platinum-group metals in hybrid circuits, (3) advanced coating techniques which minimize the use of noble metals in connector contacts, (4) advanced bearing alloys which extend bearing life under aggressive operating environments by an order of magnitude, and (5) cobalt-free alloy systems for the hard facings of engine exhaust valves.

The above outline addresses only one part of the materials cycle; namely, the materials use part of the cycle. Equally extensive outlines could be developed for other stages of the materials cycle to include extraction, benefication, primary processing, and secondary materials processing and utilization. Secondary materials processing in this context refers to the collection, processing and reuse of waste and scrap materials.

Several examples of materials extraction and processing R&D being conducted by the Department of Agriculture, Commerce and Interior, as mandated under Section 8 of The Strategic and Critical Materials Stockpiling Act of 1979, are given in FEMA's Stockpile Report to the Congress dated October 30, 1981. Bureau of Mines projects include the development of (1) new high-temperature alloys which would permit the substitution for all or part of chromium commonly used in such alloys, (2) chromium- and bauxite-free refractories for steelmaking, (3) new sources of cobalt and nickel through the processing of laterite ores near the Oregon-California border and from the recovery of cobalt and nickel from Missouri lead ores and (4) processes for extracting tungsten from California Searles Lake brines. Extensive work is also being done by the Agriculture and Commerce Departments to establish the economic feasibility of developing the guayule plant as a domestic source of natural rubber.

The development of a science and technology program for secondary materials—that is, the extraction of strategic and critical materials from urban, industrial, and mining wastes—can have important returns. Secondary materials represent a major "short cut" through the materials cycle. The processing of secondary materials not only requires substantially less energy use than the processing of primary materials, but also results in less net waste to dispose of and fewer problems in environmental management. Since fewer man hours of labor are usually required to produce a ton of recycled metal versus the primary production of a ton of metal from ores, substantial productivity gains can also be realized. Moreover, a ton of secondary materials processing capacity, as in the case of a ton of domestic primary production capacity, can displace three tons of material from the Strategic Stockpile, based on a three-year stockpile objective.

I would now like to comment on the President's National Materials and Minerals Program and Report to Congress from the perspective of the preceding remarks.

WAYS TO ENHANCE THE UTILIZATION OF OUR SCIENTIFIC AND TECHNOLOGICAL CAPABILITIES

The President's National Materials and Minerals Program and Report to Congress has been widely acclaimed by many, both in the Congress and in the private sector, as the most comprehensive statement on materials policy since the Eisenhower Administration.

The section of the President's report dealing with materials research and development provides policy initiatives for (1) defining the role of government in materials research and development; (2) reforming regulatory policies that discourage private materials research and development activities; (3) establishing through the Office of Science and Technology Policy (OSTP) mechanisms for government-industry coordination of minerals and materials research and development; (4) establishing international information exchanges on materials research and development activities; (5) broadening the opportunities for U.S. private sector participation in the development and diversification of foreign sources of supply of strategic and critical materials through the International Trade and Development Program (ITDP); and (6) providing intragovernmental coordination of federal materials and minerals research and development activities through the Federal Coordinating Council on Science, Engineering and Technology (FCCSET) of the OSTP. These are a very broad slate of policy directives which, if fully developed, would substantially enhance the utilization of the nation's scientific and technological capabilities towards achieving a vital goal.

However, the policy directives for materials research and development may be insufficient to resolve current problems and inconsistencies that have emerged in this area over the past five years or so. Also, I believe that there are ways in which the R&D program can be strengthened appreciably. The following comments and recommendations, which are admittedly implementation-oriented, are offered:

A. Intragovernmental coordination through OSTP needs to be more than just coordination in the sense of keeping assistant secretary-level officers informed of what is going on in the various federal departments and agencies. It should also include a planning function which is based on risk analysis and vulnerability assessment, such as apparently intended for the Crises Response Subgroup of the Cabinet Council on Natural Resources and Environment and normally performed by the National Security Council. This planning should identify technical issues, objectives, and strategies which overarch and help define the separate roles and missions of the federal departments and agencies. An executive office within the Committee on Materials (COMAT) to perform coordinated strategic planning and to assist OSTP in establishing program priorities is recommended.

B. The board and overlapping jurisdiction and authorities granted to the federal agencies under the Strategic and Critical Materials Stockpiling Act of 1979, Title III of the Defense Production Act; and the National Materials and Minerals Policy, Research and Development Act of 1980 have resulted in a considerable amount of overlap and redundancy among agency programs in strategic materials research and development. An additional working panel within COMAT to delineate department and agency roles and missions within the scope of existing statutes is recommended.

C. OSTP, in cooperation with the Office of Management and Budget, should conduct a retrospective review of the fiscal year 1983 budget to assure that federal programs and priorities are consistent with policies outlined in the President's Report. It would appear from a cursory review of the fiscal year 1983 budget that universities as performers in fulfilling government's role of providing a scientific base and a focus on long-term, high-risk, potentially high-payoff technology are "underrepresented and underutilized". For example, the Bureau of Mines has requested no funding for the Mineral Institutes Program in fiscal year 1983, under which 31 colleges and universities from across the nation have received research and training support in minerals engineering. In eliminating funds from this program, the Administration assumes that the university programs can be supported without federal funds. However, the implicit assumption that the minerals extraction and processing industry, which is currently operating in a survival mode, can pick up the slack in the face of declining government support of mineral colleges and universities in fiscal year 1983 and beyond seems hardly credible.

D. Previous congressional testimony and current federal programs on strategic and critical materials R&D have focused on primary production and on substitution and replacement technologies. Greater attention should be placed on materials con-

servation and secondary materials technologies. However, programs at the National Bureau of Standards in recycled materials (secondary materials) have been substantially decreased for fiscal year 1983. These reductions have been justified on the basis of transferring a larger share of the cost of this program to the private sector. However, the U.S. secondary materials industry is not only highly fragmented but is also lacking in an adequate science and technology base. Consequently, this is an instance where government assistance would be appropriate on the basis that market forces are currently incapable of achieving clearly defined national objectives.

E. Industry is already acutely aware of strategic materials issues, and has stepped-up its investments in materials substitution and conservation technologies, not only to defend against future uncertainties in availability and cost but also because there are substantial cost savings to be realized. Although the President's Report recognizes the importance of close industry-government interaction it provides no specific mechanism for such interaction. It is recommended that a direct and active liaison be established between COMAT and the National Materials Advisory Board (NMAB) of the National Research Council to involve both industry and academe in conducting studies which will assist in defining requirements and in clarifying the objectives of federal programs in strategic materials research and development.

F. The President's Report specifies initiatives to develop a scientific data base and to exchange information with free world countries. However, it does not specify how this data and information are to be collected, analyzed and made available to the private sector. In addition to maintaining a strategic materials stockpile, attention should be given to establishing an "information stockpile" to provide the means for both diffusing information and facilitating technology transfer to the private sector as principal "deliverables" of both government R&D programs and information exchanges. Such a role could be assigned to the National Bureau of Standards.

In summary, the President's Report provides a comprehensive policy for reducing the nation's vulnerability in strategic and critical materials. Its materials research and development program can be responsive to the potential role of technological innovation in assuring that the U.S. meets our future materials needs for economic growth and national defense. That potential can be appreciably enhanced if implementation is promptly initiated, to include the specific actions and activities which I have described.

Thank you for providing me an opportunity to present my views and recommendations concerning the National Materials and Minerals Policy and Program. I will be happy to respond to any questions you may have, whether in writing or by visits to your offices.

Respectfully,

ARDEN L. BEMENT, JR.

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